RAILROAD GAZETTE

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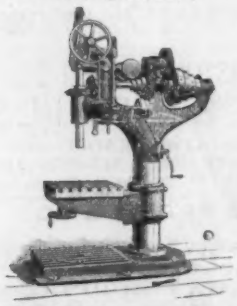

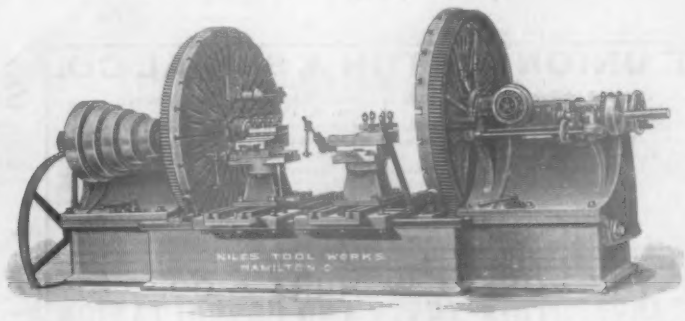

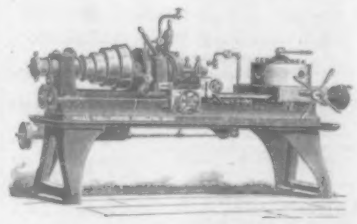

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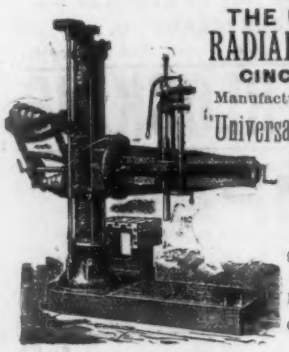

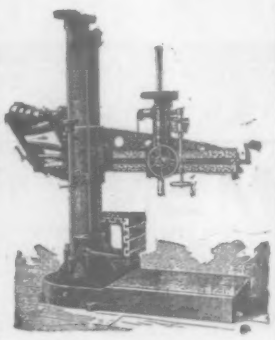

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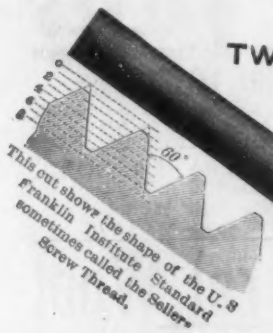

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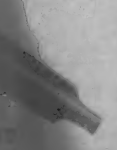

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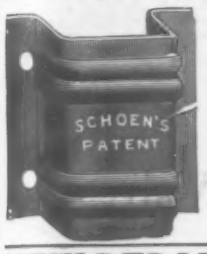

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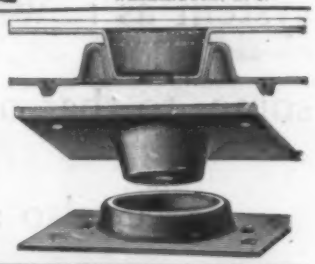

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ALPHABETICAL INDEX TO ADVERTISEMENTS.

[Classified Index on the next page.

Abendroth & Root Mfg. Co. ....
Acme Machy. Co. 9
Adams, Oliver 1
Adams & Westlake Co. ....
Alax Metal Co. 34
Akron Tool Co. 25
Allen Paper Car Wheel Co. ....
Allentown Rolling Mills 1
Allison Mfg. Co 26
American Car Door Co. 23
Amer. Cont. Drawbar Co. 6
American Fluoride Co. 6
Amer. Steel Scraper Co. 16
American Steel Wheel Co. 31
American Washer & Mfg. Co. 34
Anderson & Barr 31
Appleton, Thomas 14
Ashcroft Mfg. Co. 13
Ashton Valve Co. 1
Austin, F. C., Mfg. Co. 15
Auto-Interch. Car Coup. Co. 27
Baker, Wm. C. 39
Baldwin Loco. Wks. 35
Baltimore Car Wheel Co. 33
B. & O. R. R. 15
Barkly & House 11
Barnes, D. L. 12
Barnum & Richardson Mfg. Co. 32
Bement, Miles & Co. 6
Berlin Iron Bridge Co. 34
Berry & Orton Co. ....
Bethlehem Iron Co. 1
Billings & Spencer Co. 7
Blackmer & Post Pipe Co. 1
Bliss, W. W., Co. 9
Bloomsburg Car Co. 26
Bogue & Mills Mfg. Co. 15
Boston Bridge Works 26
Boston & Albany R. R. 33
Bowler & Co. 30
Boyden Brake Co. 14
Boyer Ry. Speed Recorder 16
Bradley, Osgood & Son 40
Bridgeport Mach. Tool Works 40
Brightly, C. H. 13
Brill, J. G. & Co. 26
Brooks Loco. Wks. 32
Brown Bros. & Co. ....
Brown Hoist. & Conv. Machine Co 16
Brown & Sharpe Mfg. Co. 22
Buckeye Auto. Car Coup. Co. 29
Bucyrus Steam Shovel & Dredge Co. 17
Buda Foundry & Mfg. Co. ....
Buffalo Seal & Press Co. 16
Burkhardt's, Geo. J. Sons 11
Bush Cattle Guard Co. 11
Butler Drawbar Attach. Co. ....
Cabell, L. Breckinridge 13
Cambria Iron Co. ....
Canda Mfg. Co. 26
Canning, R. & Co. 1
Canton Steel Roofing Co. 38
Car Ventilator Co. 28
Carlin's Sons, Thos 13
Cayuta Wheel & F'dry Co. 31
Central Oil & Supply Co. 3
Chester Steel Castings Co. 40
Chicago Bridge & Iron Co. 37
C., B. & Q. R. R. ....
C. C. C. & St. L. Ry. 15
C., H. & D. Ry. 33
C., M. & St. P. Ry. 33
C., R. I. & P. Ry. 15
Chicago & Alton R. R. 33
Chicago & N. W. Ry. 32
Church Co., John 12
Cleveland City Forge & Iron Co. 1
Cleveland Frog & Cross. Co. ....
Congdon Brake Shoe Co. 27
Connelly, J. T. 38
Consolidated Car Heating Co. 25
Cont. Rail Joint Co. of Amer. 24
Cooke Loco. & Mach. Co. 25
Copeland & Bacon ....
Creosote Lum. & Const. Co. 35
Croes, J. J. R. 13
Curtis Regulator Co. 29
Cushion Car Wheel Co. 34
Damascus Bronze Co. 30
Davenport & Fairbairn 37
De LaVergne Ref. Mach. Co. 16
Delaware Car Works 24
Detroit Bridge & Iron Wks 36
Detroit Lubricator Co. 35
Dietz & Orton Co. 1
Dillmeyer, Mills & Co. ....
Dixon Crucible Co., Jos. 16
Drake & Walker 40
Drexel Ry. Supply Co. 38
Dudgeon, Richard 18
Dudley & Co., W. W. 12
East. Gran. Roof Co. 16
Eckstein, C. G. & Co. 13
Edge Moor Bridge Works 37
Egan Co., The 9
Electric Secret Service Co. 14
Elliot Frog & Switch Co. 38
Elmira Bridge Co. 36
Employment 13
Engin. Employm. Bureau 13
Engineering Magazine 15
Eno Rail Joint Co 31
Ensign Mfg. Co. 26
Erie Car Works 36
Eureka Cast Steel Co. ....
Eureka Nut Lock Co 24
Evans, Geo A. 13
Excelsior M. & B. Co. 38
Fairbanks, Morse & Co. 10
Falls Hollow Stay Bolt Co. 34
Farist Steel Co. 18
Fay, J. A. & Co. ....
Ferracute Machine Co. 11
Field Water Purifier Co. 10
Fisher Rail Joint Works 5
Fishkill Landing Mach. Co. 3
Fitchburg R. R. 15
Fitzgerald, S. C. 1
Flagg, Stanley G. & Co. ....
Flood & Conklin Co. 18
Fontaine Crossing Co. 32
Foos Mfg. Co. ....
Foster Engineering Co. ....
Fowler, Geo. L. 13
French Spring Co., A. 18
Frescoln, S. W. 39
Fuller Bros. & Co. 32
Gardner, O. E. ....
Gates Iron Wks. ....
Gilbert, Bradford L. 1
Gill-Alexander El. Mfg. Co. 18
Goff & Sons, D. ....
Gold Car Heating Co. 25
Goodwin, J. B. 6
Gorham Pneumatic Gate Co. 7
Gould Coupler Co. 28
Gould & Eberhardt ....
Goulds Mfg. Co 21
Greenlee Bros. & Co. 6
Guarantee Co., N. A. ....
Hale & Kilburn Mfg. Co. 27
Hall Signal Co. 19, 30
Halsey, Jas. T. 15
Hammett, M. C. 34
Hartford Steam Boiler I. & I. Co. 17
Harvard University (Eng. Dept.) 2
Harvey Steel Car Co. 36
Hayes Tool Co. 13
Heller & Brightly 13
Hendricks Bros. 32
Hildreth, R. W. & Co. 13
Hinckley Brake Co. 31
Hinson Car Coupler Co. 38
Hinson Draw Bar Attach 31
Hoosac Tunnel Route 39
Hope & Co 34
Hopkins, D. A., Mfg. Co. 13
Howard Iron Wks. ....
Howson & Howson ....
Humphreys & Sayce 13
Hunt, C. W. Co. 15
Hunt, Robt. W. & Co., The 1
Hutchins, C. B., & Sons 40
Illinois Central R. R. 31
Illinois Steel Co. 18
Industrial Works 17
Ingersoll Milling Mach. Co. 9
Ingersoll-Sargent Drill Co. 17
Jackson & Sharp Co. 36
Jackson & Woodin Mfg. Co. 37
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Johnson Railroad Signal Co. 1
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Jones, B. M., & Co. 6
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Kan. City, Ft. Sc. & Mem. R. R. 32
Ketcham, C. F., & Co. 15
Keuffel & Esser Co. 12
Keystone Bridge Co. 33
Kinsman Block System Co. 31
Laidlaw & Dunn Co. 21
Lake, J. H. ....
L. S. & M. S. R. R. 33
Latrobe Steel Works 31
Lee Composite Mfg. Co. ....
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Lehigh Valley R. R. ....
Leonard, H. Ward & Co 1
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Link Belt Engineering Co. ....
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Lucius, Albert 1
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Mairs & Lewis 13
Males, A. S. & Co. 13
Manning, Maxwell & Moore 2
Marion Steam Shovel Co 17
Martin Anti-Fire Car Heat. Co. 6
Mason Regulator Co 22
McClure, Alex. 38
McCoy Co., Jos. F ....
McConway & Torley Co 29
McGill Iron Works Co. 37
McSherry Mfg. Co. 18
Meneely Bearing Co. 17
Merrill-Stevens Co. 11
Metcalf, Paul & Co. 18
Michigan Central Ry. 36
Michigan Forge & Iron Co. 18
Middleton, W. S. 13
Middletown Car Works 37
Midvale Steel Co. 30
Missouri, Kansas & Texas Ry. 12
Missouri Pacific Ry 32
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Morton & Co., Ed. 12
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Portland Co. 34
Pottsville Bridge Co. 37
Pratt & Letchworth 38, 40
Prindle & Co., H. B. 17
Prosser, Thos., & Son 30, 35
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Queen & Co. 18
C. & C. Co. 32
Railroad Lighting & Mfg. Co. 25
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Ramapo Wheel & F. Co. 32
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Reeves, Paul S. ....
Rendrock Powder Co. 15
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Scott Spring Co., Chas. ....
Sellers, Morris & Co. 10
Sellers, Wm. & Co. ....
Shaller & Schmidlapp 26
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Sheffield Velocipede Car Co. 40
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Shoenberger & Co. 18
Shoulder Tie Plate Co. 5
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Smith, F. H. 13
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Sooysmith & Co. 36
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Wellman Iron & Steel Co. 18
Western Fence Co. 6
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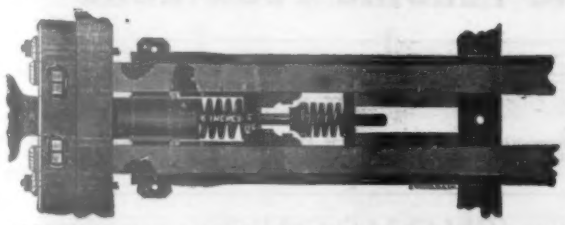

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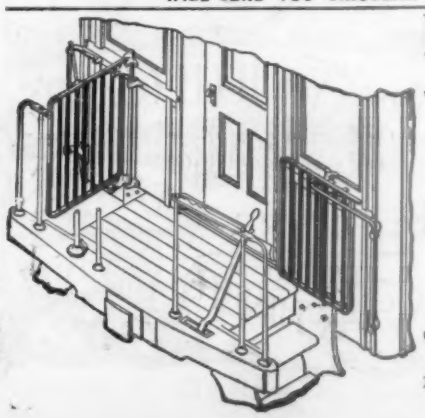

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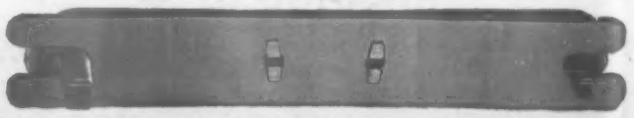

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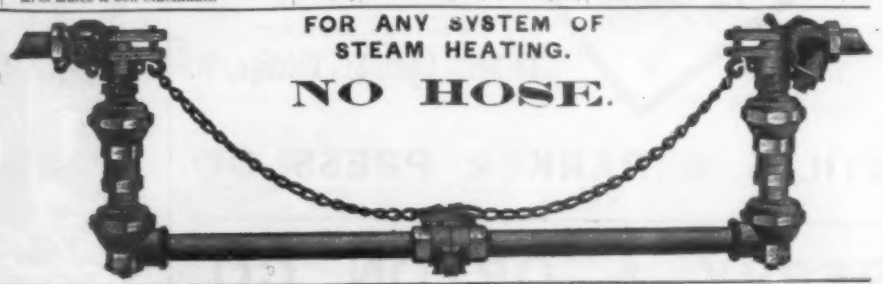

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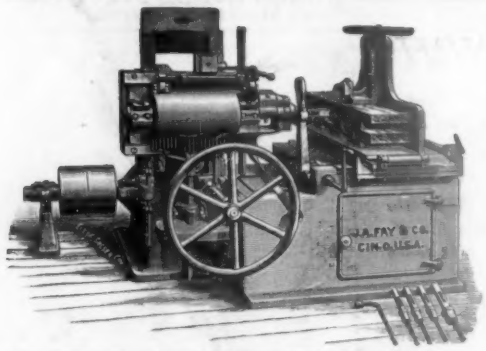

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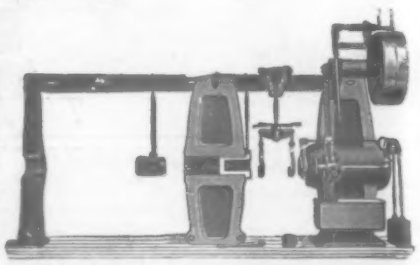

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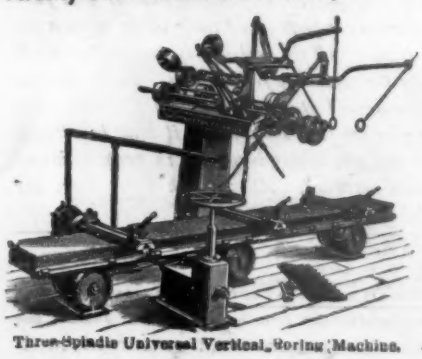

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Designers and Manufacturers of

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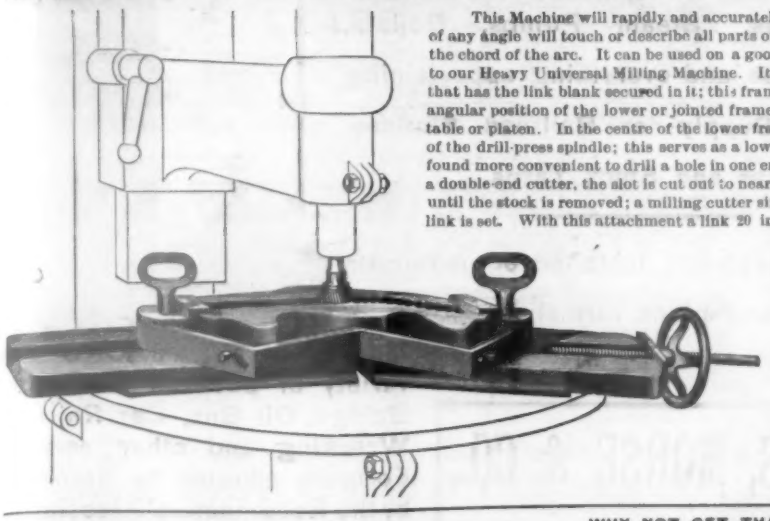
LEEDS' LINK MILLER AND SLOTTER.



This Machine will rapidly and accurately mill out Links to any desired radius. It is designed on the principle that the apex of any angle will touch or describe all parts of a circle whose versed sine is equal to the perpendicular where the base is formed by the chord of the arc. It can be used on a good, strong drill press, and will do excellent work. It can also be used as an attachment to our Heavy Universal Milling Machine. It consists of a jointed frame having dove-tail slots running lengthways to carry a frame that has the link blank secured in it; this frame is actuated by the screw and hand wheel, and describes a circle according to the angular position of the lower or jointed frame; flanges are cast on the bottom of this frame for the purpose of bolting down on the table or platen. In the centre of the lower frame, at the centre of the joint, is a bronze bushing that is set exactly under the centre of the drill-press spindle; this serves as a lower support for a boring bar and the shank of the milling tool arbor. In practice it is found more convenient to drill a hole in one end of the link to be slotted large enough for a boring bar to pass through; then, by using a double-end cutter, the slot is cut out to nearly the finished size; the link is then moved along ⅝ or ½ in., and is cut through again until the stock is removed; a milling cutter similar to a reamer is then used, and the slot is then finished to the radius for which the link is set. With this attachment a link 20 in. long is finished in about four hours. Directions for setting and operating are furnished for any particular case. Cutters or boring bars, milling cutters, arbors and mills made to order. This machine is the invention of Mr. P. Leeds, M. M. Louisville & Nashville R. R. Co., and he has had it in very satisfactory use for some time. This method is much superior to any other he has used heretofore.

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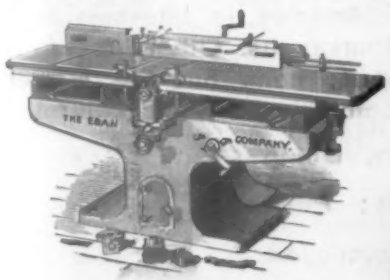

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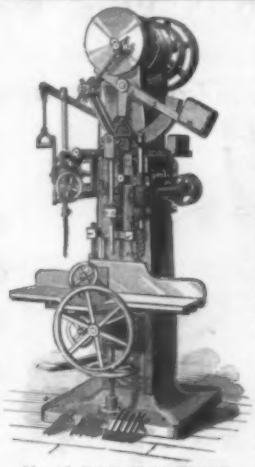

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Special Milling Machines

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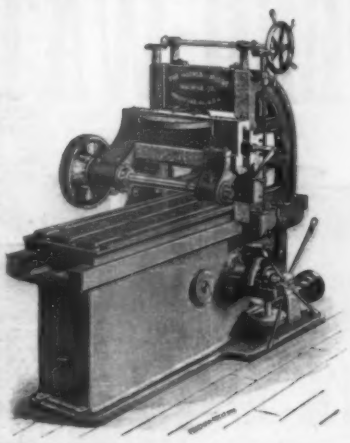

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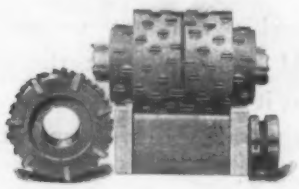

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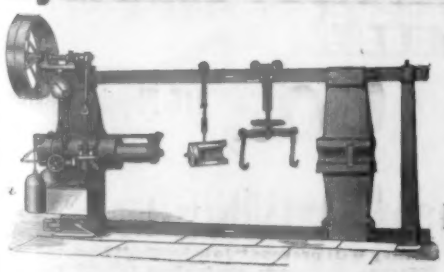

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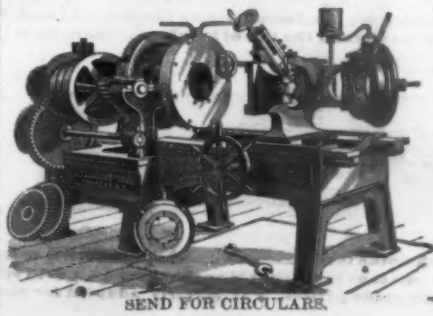

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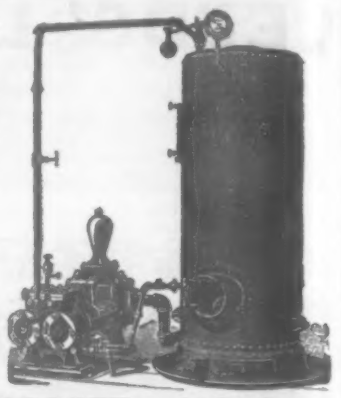

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WRECKING FROGS, Track Tools, Scrapers, Dump Cars, Carts and other earth-moving implements; Push Cars, Raillayers' Cars; Single, Duplex and Compound Pumps, Windmills and Force Pumps, Engines and Boilers.

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This device will not successfully handle **all waters,** but there are **none** that it will not improve. In a **large majority** it will demonstrate great economy.

The apparatus can be made at railroad shops at small expense.

A trial is solicited at our expense.

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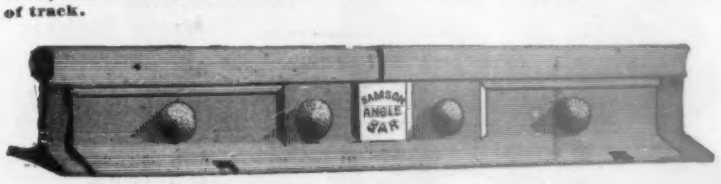

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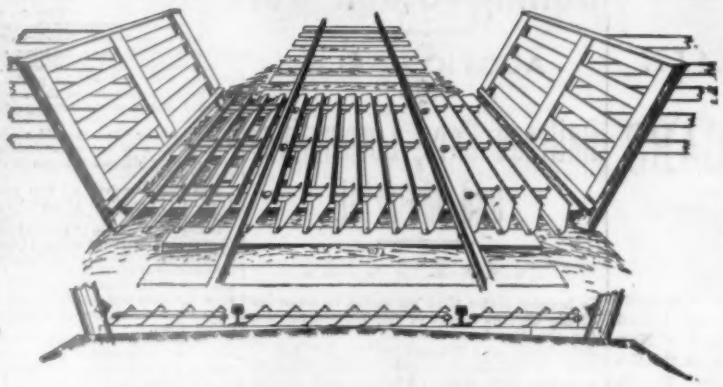

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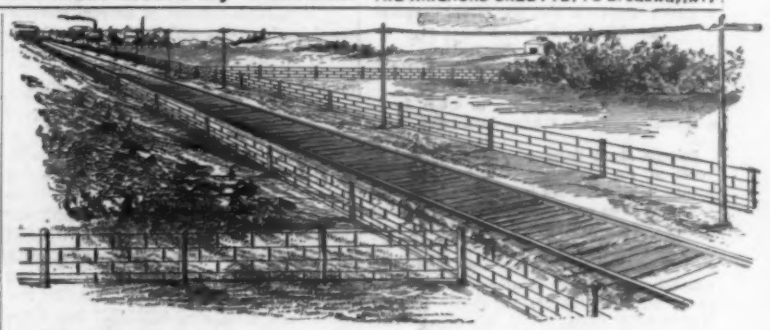

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Atchison, Topeka & Santa Fe Railroad Company,

P. O. Box 346, No. 95 Milk Street, Boston, Aug. 23, 1892.

INCOME BOND CONVERSION

UNDER CIRCULAR No. 68.

Income Bonds will be received for exchange into Second Mortgage Bonds, Class A, until October 1, 1892, by the following appointed agencies:

UNION TRUST CO. OF NEW YORK
At Office of Atchison Co.,
95 Milk St., Boston.
UNION TRUST CO. OF NEW YORK,
80 Broadway, N. Y. City.
BARING BROTHERS & CO., Ltd.,
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Income Bond Scrip of any class will be received for exchange, the same as the bonds, in amounts not less than $100, and in even hundreds or thousands.

ORAL AND WRITTEN INQUIRIES concerning this Exchange and applications for Circulars and blanks for use thereunder can be made of any of above agencies and of J. W. REINHART, VICE-PRESIDENT ATCHISON COMPANY, 95 MILK ST., BOSTON. By order of the Board of Directors.

GEORGE C. MAGOUN, *Chairman.*
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Schlenker's Automatic Bolt Cutters and Screw-Cutting Machines.
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UNITED STATES ROLLING STOCK CO

AUCTION SALE

—OF—

RAILROAD CARS,

Locomotives and Material.

NOTICE

Is hereby given that pursuant to an order of the Circuit Court of the United States for the Southern District of New York, duly made and entered on the 6th day of July, 1892, in a cause therein pending between Henry D. Laughlin and others, complainants, and the United States Rolling Stock Company, defendant, and to orders conformatory thereof duly made and entered in the Court of Common Pleas for Champaign County, Ohio, on the 2d day of August, 1892, and in the Circuit Court of the United States for the Northern District of Alabama, on the 12th day of August, 1892, I, the undersigned, William C. Lane, Receiver of the property, assets and effects of The United States Rolling Stock Company, will sell at public auction for cash on the 26th day of September, 1892, at 10 o'clock A. M., at the works of the United States Rolling Stock Company, at New Decatur, Alabama, the following described rolling stock and material: 50 drop bottom coal cars, 3 coal cars, 28 refrigerator cars, 5 flat cars, 3 box cars, 1 locomotive, 897 new wheels, 23,400 lbs. scrap wheels, 62,400 lbs. axles, 193 automatic couplers, 77,837 lbs. bolts, nuts, etc., 90,000 square head bolts, 1,156,475 lbs. bar iron, forgings, castings, scrap, 60 tons coal, 842,214 ft. lumber, 3,777 gals. painters' material, 14,050 lbs. painters' material, 2,091 gals. oil, 15,992 brick, 298 ft. piping, 463 pieces sewer pipe, 4,585 ft. belting.

Also a large amount of general material used in the construction of cars, maintenance of machinery, etc.; also an assortment of office furniture.

And on the 27th day of September, 1892, at 12 o'clock noon, at the works of The United States Rolling Stock Co., at Anniston, Alabama, the following described rolling stock and material: 123 box cars, 88 flat cars, 15 gondola cars, 9 refrigerator cars, 1 locomotive, 5,157 car wheels, 411 automatic couplers, 977,851 lbs. axles, 88,151 lbs. bolts, rivets, nuts, keys, etc., 5,072,846 lbs. bar iron, pig iron, forge iron, castings, 89,730 lbs. steel bars, rails, etc., 1,245,757 lbs. scrap (forgings, cast, wrought, etc.), 861,120 lbs. coal, coke, etc., 512,730 ft. lumber, 4,870 gals. painters' material, 2,840 lbs. painters' material.

Also a large amount of general material and supplies used in construction of cars, maintenance of machinery, etc.; also an assortment of office furniture.

And on the 29th day of September, 1892, at 12 o'clock, noon, at the works of The United States Rolling Stock Co., at Ball Play, Alabama, the following described rolling stock and material: 2 flat cars, 1 locomotive, 5,850 ft. lumber, 110 second-hand steel rails; also a small amount of sundries.

And on the first day of October, 1892, at 10 o'clock A. M. at the works of The United States Rolling Stock Co., at Urbana, Ohio, the following described rolling stock and material: 20 box cars, 10 stock cars, 10 flat cars, 1 gondola car, 1 locomotive, 487 car wheels, 92 axles, 65,058 lbs. steel bar and sheet iron, 3,452 pieces forgings, 55,537 lbs. scrap forgings, 61,973 lbs. castings, 94,000 lbs. scrap, (cast, wrought, etc.), 91 tons coal, coke, etc., 163,808 ft. lumber, 782 gals. painters' material, 6,901 lbs. painters' material, 366 gals. oil, 154 ft. belting.

Also a large amount of general material and supplies used in the construction of cars, maintenance of machinery, etc.; also an assortment of office furniture.

A detailed list of the property to be sold will be furnished at the time and place of sale; and may also be obtained before that time upon application to the Receiver at his office, No. 45 Broadway, in the City of New York.

WILLIAM C. LANE, Receiver.

UNITED STATES Rolling Stock Co.

AUCTION SALE

—OF—

Railroad Cars, Locomotives and Material.

NOTICE

Is hereby given that pursuant to an order of the Circuit Court of the United States, for the Southern District of New York, duly made and entered on the 6th day of July, 1892, in a cause therein pending between Henry D. Laughlin and others, complainants, and The United States Rolling Stock Company, defendant, and to an order confirmatory thereof duly made and entered in the Circuit Court of the United States, for the Northern District of Illinois, on the 27th day of July, 1892, I, the undersigned, William C. Lane, Receiver of the property, assets and effects of The United States Rolling Stock Company, will sell at public auction for cash, on the 3d day of October, 1892, at 12 o'clock noon, at the works of The United States Rolling Stock Company, at Hegewisch, Illinois, the following described rolling stock and material: One hundred and four stock cars, 28 box cars, 17 flat cars, 17 refrigerator cars, 14 gondola cars, 7 miscellaneous cars, 3 locomotives, 355 car wheels, 30 pairs of car wheels on axles, 148 axles, 414,160 lbs. bolts, washers an dnuts, 2,890 gross screws, 3,030,687 lbs. bar and pig iron, forgings, castings and coupling pins, 162½ tons scrap, 20,000 lbs. coke, 10,000 lbs. limestone, 2,100,000 feet lumber, 2,712 gals. painters' material, 14,860 lbs. painters' material.

Also a large amount of general material and supplies used in construction of cars, maintenance of machinery, etc.; also an assortment of office furniture; also a large amount of beds, bedding, chairs, carpets, shades, crockery, table and kitchen utensils.

A detailed list of the property to be sold will be furnished at the time and place of sale; and may also be obtained before that time upon application to the Receiver at his office, No. 45 Broadway, in the City of New York.

WM. C. LANE, Receiver.

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In order to meet the demands which come from every quarter of the North and East for cheap rates, in order to enable the farmer, the emigrant and the capitalist to visit the Southwest and particularly TEXAS, the MISSOURI, KANSAS & TEXAS RAILWAY have determined to sell tickets on Aug. 30 to all points on its main line in Missouri, Kansas and the Indian Territory, south of Clinton, Mo., to all points in Texas, at the extremely low rate of ONE FARE FOR THE ROUND TRIP, good to return 20 days from date of sale. Now is your opportunity. Go and see for yourself.

For further information as to rates, routes, maps, time tables, etc., call on or address,

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PACIFIC

PROPOSALS.

SANITARY DISTRICT OF CHICAGO.

TO CONTRACTORS.

Sealed proposals addressed to the Board of Trustees of the Sanitary District of Chicago, and indorsed: "Proposals for Excavating the Main Drainage Channel" will be received by the clerk of said Sanitary district at Room H, Rialto Building, Chicago, Ill., until 12 M. (standard time) of Wednesday, the 19th day of October, 1892, and will be publicly opened by the said Board of Trustees at the regular meeting held that day, or at a special meeting called for that purpose.

The work for which the said tenders are invited is the excavation of the main drainage channel for the said sanitary district between Willow Springs and Summit, Ill.

Bids will be received on two propositions, designated as "Proposition 1" and "Proposition 2," respectively.

Under "Proposition 1" the said work will consist in all of the excavation of about 11,400,000 cubic yards of earth, and of about 500,000 cubic yards of rock, and the building of 40,000 cubic yards of dry rubble walls, and under "Proposition 2" it will consist in all of about 7,825,000 cubic yards of earth, of about 350,000 cubic yards of rock, and of 40,000 cubic yards of dry rubble walls.

Said work will be divided into six sections, each of which will be treated as a separate contract in canvassing the proposals and making awards. As all awards will be made by individual sections as provided in the specifications and forms of proposals to be furnished bidders, each bidder must make prices for each section, separate and distinct from every other. The lumping of prices in any bid will render such bid informal, and will cause its rejection by the said Board of Trustees.

As the question of which proposition will be acted upon will not be determined by the Board of Trustees until after the time set for receiving proposals, the bidder is allowed to make two alternative tenders, based upon the terms of the specifications for each of the two propositions respectively.

Each proposal must be accompanied by a certified check, or cash to an amount equal to $8,000 multiplied by the number of sections bid upon; provided that the said check or cash shall entitle the bidder to make tender under one or both of the said propositions.

All certified checks must be drawn on some responsible bank doing business in the city of Chicago, and be made payable to the order of the Clerk of the Sanitary District of Chicago. Said amount of $8,000 for each section will be held by the Sanitary District until all of said proposals have been canvassed and contracts awarded and signed, the return of said check or cash being conditioned upon any bidder to whom an award of any portion of said work may be made appearing within ten days after notice of such award being given, with bondsmen, and executing a contract with the Sanitary District for the section or sections of said work so awarded, and giving a bond satisfactory to the said Board of Trustees for the fulfillment of the same in the amount of $75,000 for each section of work awarded him.

All proposals must be made upon blank forms furnished by the Sanitary District, and must give the price for each separate item of work.

The bids will be compared on the basis of the engineer's approximate estimate of quantities, which will be furnished with copies of the specifications.

No propos l will be considered unless the party making it shall furnish evidence satisfactory to the Board of Trustees of his ability to do the work, and that he has the necessary pecuniary resources to fulfill the conditions of the contract, provided such contract shall be awarded him.

Bidders are required to state in their proposals their individual names and places of residence in full.

Specifications and plans may be seen at the office of the Chief Engineer, Room D, Rialto Building, Chicago, Ill.

The said Board of Trustees reserves the right to reject any and all bids.

THE SANITARY DISTRICT OF CHICAGO,
By FRANK WENTER,
President of its Board of Trustees.
Attest: THOMAS F. JUDGE, Clerk.
CHICAGO, Ill., Aug. 20, 1892.

PORTLAND AND RUMFORD FALLS RAILWAY.

NOTICE TO CONTRACTORS.

Propositions for the construction of a line of railroad from Mechanic Falls to a connection with the Maine Central Railroad, at some point between Danville Junction and Auburn, will be received at the office of the Company, No. 34 Exchange St., Portland, Maine, until Saturday, October 8th, 1892, at two o'clock in the afternoon.

Profiles, plans, specifications, forms of bid and contract, can be seen at the Company's office after September 20th, 1892. The right to reject any and all proposals is retained.

FREDERIC DANFORTH,
Chief Engineer.
Portland, Maine, Sept. 15th, 1892.

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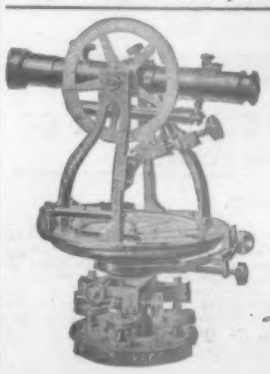

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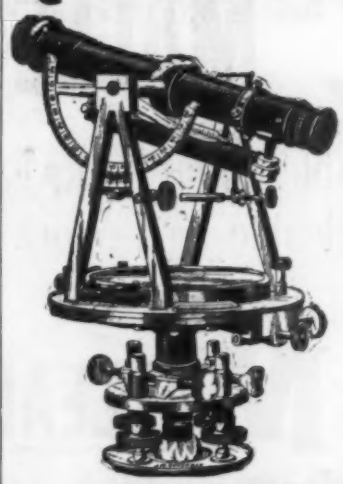

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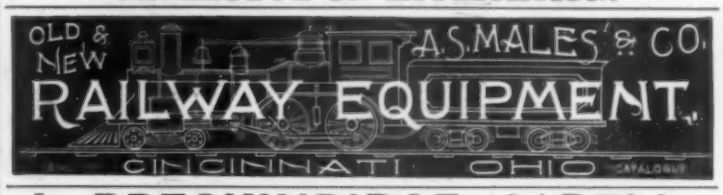

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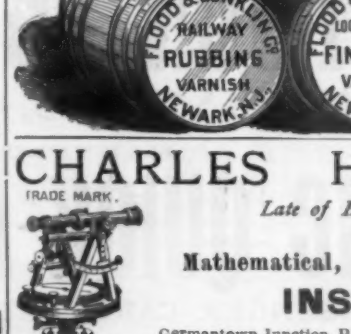

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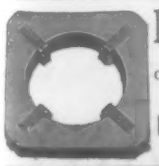

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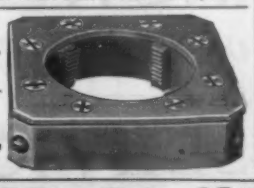

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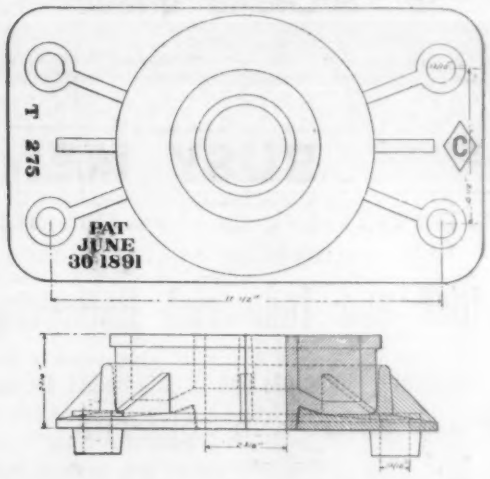

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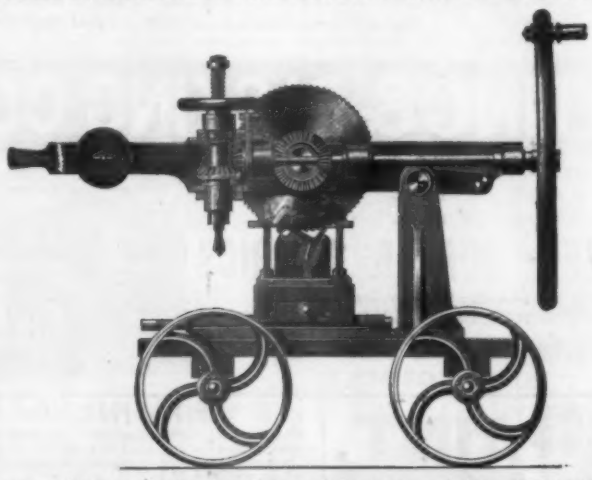

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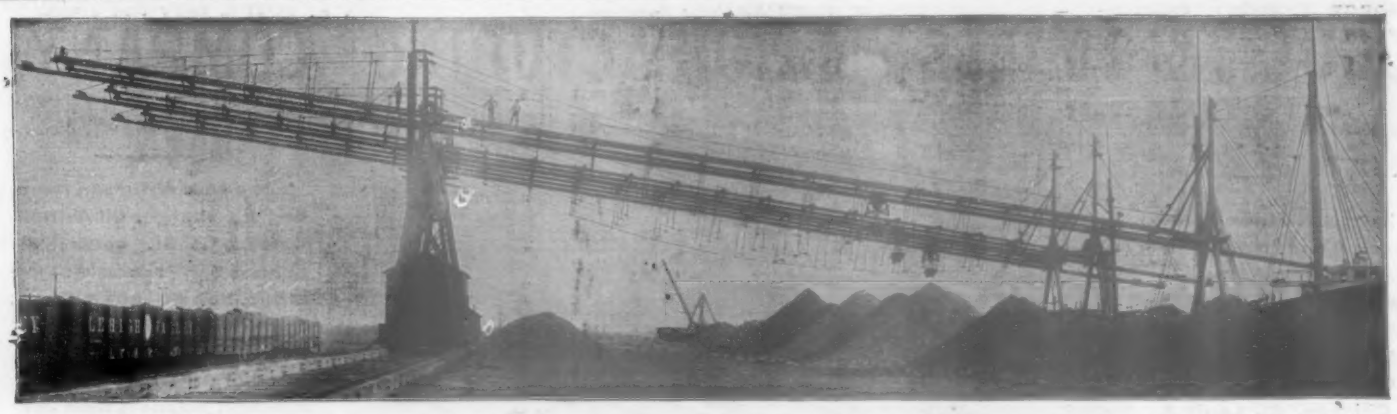

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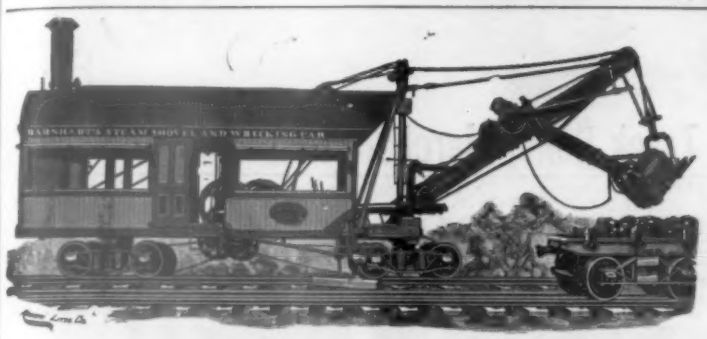

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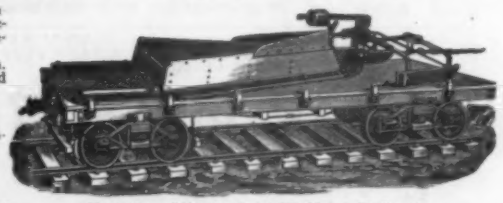

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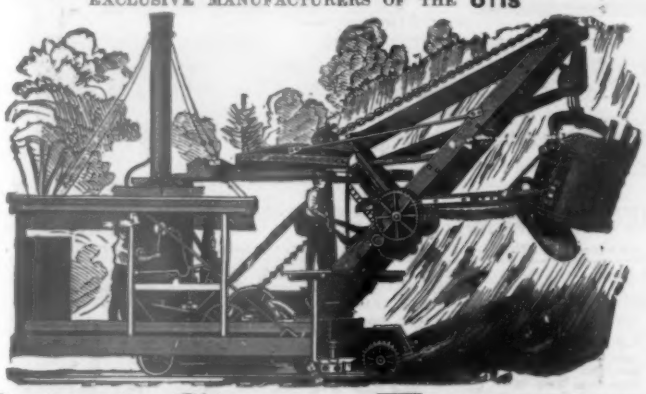

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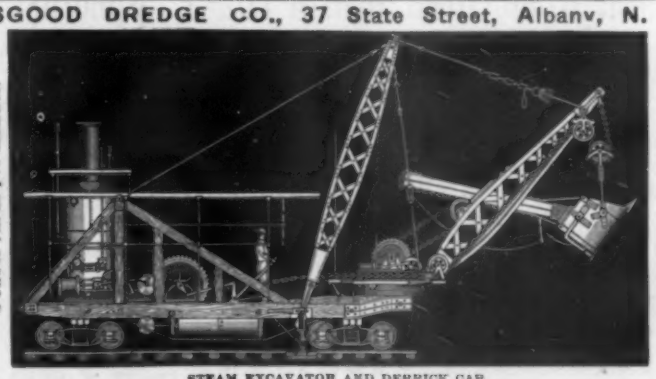

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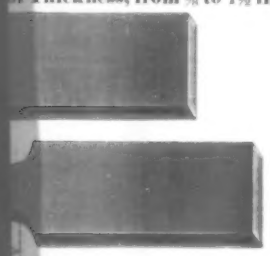

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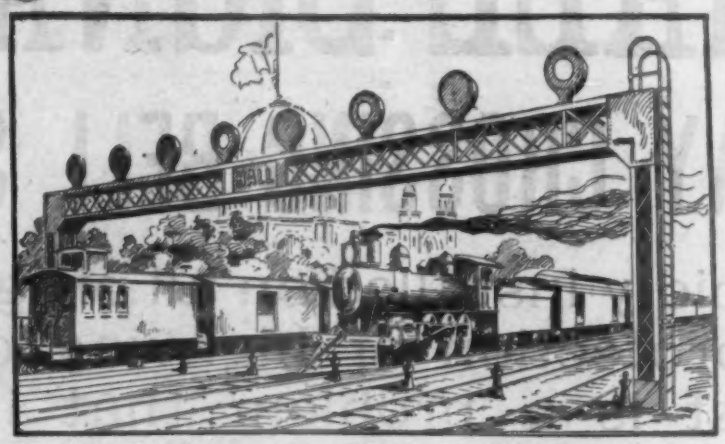

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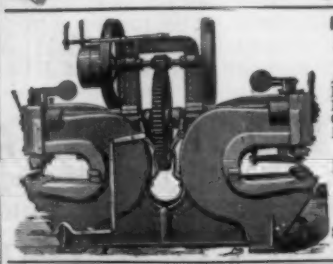

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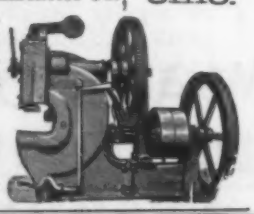

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RAILROAD GAZETTE

FRIDAY, SEPT. 23.

CONTENTS.

ILLUSTRATIONS: PAGE.
Transportation of a 120-ft. Plate Girder..... 698
World's Columbian Exposition—Terminal Railroad Station..... 699
The Kinsman Block System 700
Chesapeake & Ohio Stone Car..... 702
Location of the New York and New Jersey Bridge 704
Iron Pier Between Tracks at Trenton..... 704
Compound Swivel Head for Universal Cutter and Reamer Girder..... 705
Connelly's Axle Lubricator. 706
Steel Needle-Beam for Pullman Standard Cars..... 706

CONTRIBUTIONS:
Some Defects in Parlor and Sleeping Cars..... 697
The Problem of Stopping from Ninety Miles an Hour..... 697
Some Disputed Points in Bridge Engineering..... 697

EDITORIALS:
The Never-Ending Whistle Racket..... 709
Courtesy as an Investment. 709
Trusting the Engineman... 709
The Ocean Transportation of Petroleum..... 710
The Railroads and the Cholera..... 710

EDITORIAL NOTES 709, 710
New Publications..... 711
Trade Catalogues..... 711

GENERAL NEWS:
Locomotive Building..... 712
Car Building..... 712
Bridge Building 712
Meetings and Announcements..... 712
Personal..... 714
Elections and Appointments 714
Railroad Construction..... 714
General Railroad News.... 716
Traffic..... 716

MISCELLANEOUS:
Technical..... .....706, 710
The Scrap Heap 711
Railroad Sanitation in Times of Cholera..... 698
Dating Tickets by Perforation..... 701
The "Brady" Electric Conduit System, ... 701
The Construction and Operation of the State Railroads of Bosnia and Herzegovina 702
Notes on British Train Speeds..... 702
Steam Car Heating..... 704
Provident Funds on Indian Railroads..... 705
Religion on Railroads..... 706
The German Parcels Post.. 706

Contributions.

The Servis Tie Plate Again.

NEW YORK, Sept. 21, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The personalities of the letter of the Q & C Company, which was published in your issue of the 16th inst., I ignore, out of consideration for the reader, for I know how extremely tiresome personal discussions are in newspapers. Your public cares nothing for attacks upon my personal character, but it does care a good deal about the faults of the Servis tie plate, and this is the kernel of the whole discussion, and to this I shall confine myself. The question is then, Does the use of the Servis tie plate provoke or promote shearing of the spikes? This question has passed beyond the region of theoretical speculation, and I beg to offer you the following evidence that it does:

. . . *Railroad Company,*
Chief Engineer's Office,
Feb. 9, 1892.

J. Churchward, Esq., Q & C Company, New York:

DEAR SIR: In a letter recently received from a correspondent he speaks of an accident that happened on the Ohio division of the Baltimore & Ohio Railroad and one on the Chicago, Rock Island & Pacific Railway, where track was laid with Servis tie plates and common iron spikes, and states that in both cases every spike was sheared clean on the outside rail. He says the Baltimore & Ohio accident was on a curve and the speed about fifty miles an hour. The Rock Island accident, he says, was on a piece of new track, laid only two weeks, with good oak ties, straight line and at a moderate speed. In this case 1,100 ft. of rail went out, shearing every spike on outside. Neither rail nor splices were broken, but the gauge was slipped out. He says the whole matter for 1,100 ft. was like tearing a piece of cloth.

I would like to inquire if you have heard anything of these accidents, and, if so, to what you attribute them. We laid some Servis tie plates on a sharp curve near one of our slips in . . . , and tried to have them to take the place of guard rail braces, but we found they would not work at all. The rail shoved out a good deal as mentioned above, bending the spikes over and breaking them off. A piece of track that we laid west of . . . , on a reverse curve, with Servis tie plates, shows somewhat the same tendency; that is, to shove the spikes over or break them off and widen the gauge.

Have you had any experience with the sort of difficulty connected with the use of the Servis tie plate; the experience outlined above would seem to indicate that the Servis tie plates are rather dangerous things to fool with.

Yours truly, ..., Chief Engineer.

The above is the letter referred to by the Q & C Co. in your issue of the 16th. I hardly think that any one could claim that this letter is one to a company and not an individual.

In June, 1891, a curve of 10 degrees was laid on the Western New York & Pennsylvania Railroad at Rochester with the Servis plates and common spikes. Two or three days afterward a coal train sheared the head off every outside spike. I advised the Q & C Co. of this accident by letter, dated June 27, 1891. I believe that these two cases are all that is necessary to demonstrate the shearing or breaking of spikes with the Servis plate. If it is not I can supply more.

J. CHURCHWARD, C. E.

[It seems but simple justice to publish this, that the reader may judge for himself as to the nature of the letter which was referred to by the Q & C Co. in our last issue and which is the basis of the charges made by that company against Mr. Churchward. We must add that the officers of the B. & O. and of the Rock Island deny the accidents mentioned in the letter.—EDITOR RAILROAD GAZETTE.]

Some Defects in Parlor and Sleeping Cars

TO THE EDITOR OF THE RAILROAD GAZETTE:

As one of the travelling public who has occasion to travel not infrequently in the parlor cars of the Pullman and Wagner Car Companies, I would like to know if the designers of these cars have reached the limit of their ability in providing for the comfort of passengere. If not, why do they still use an arrangement of chairs such that all face must one way if one would avoid a continual conflict with his neighbor by means of the chair backs? The solitary traveler on entering one of these cars with high backed chairs is apt to find that the occupant of one of the adjacent chairs has preferred to turn his chair and face his traveling companion. The S. T. can then face his chair either out or in at an angle of about 30 degrees with the centre line of the car, but when once fixed he must remain so, or can turn his chair only by turning his neighbor's too. And, of course, if his neighbor moves, he must perforce follow suit, and thus they joggle each other throughout the trip.

The above comment applies especially to Wagner cars at the present time, as far as the writer's observations have extended, but the Pullman cars are not yet perfect. When that tantalizing invention called a buffet is in operation, it is apparently necessary in order to put up a table that two adjacent chairs should face each other. Therefore, if chair No. 5 has lunch at one o'clock, the occupant of No. 7 must bear witness to the operation, and if No. 7's turn comes later, No. 5 must return the compliment or take refuge in the smoking room. Is there any practical reason why tables cannot be made with an offset where they are attached to the side of the car, so as to clear the back of the next chair ahead? Speaking of smoking rooms reminds me that there are some parlor cars running in which the ingenuity of the designer has stowed that refuge away in a corner, as it were, so that not one man in six can get into it on his first attempt without a guide.

Would it not be well if the designers of these cars paid less attention to ornamentation and general gorgeousness and a little more to the comfort of the passengers who pay for them? When we travel in some of the parlor cars operated by railroad companies, as the charges are generally much less than in Wagner and Pullman cars, we do not expect much besides the additional space and the freedom from the going and coming of the station to station travelers which is found in the ordinary coaches. In point of fact, the traveler frequently gets much more comfort, and pays less for it. This statement does not apply, by the way, to the Long Island Railroad company's three-seat-abreast parlor (?) cars.

With the growth of the parlor and sleeping car business, the character of the service, as far as the passenger is concerned, seems to have depreciated, although the prices for accommodations are as high as ever. It is by no means uncommon to find that the car porter has only been on that run for one or two trips, and, therefore, is not only unable to give the unsophisticated traveler any information, but on the 24 and 30-hour trips he does not know enough about the details of the route to see that his tanks and coolers are filled at the proper stations, with the result that long before the end of the run not a drop of water is to be had. And when we find catches loose on windows, a toilet room lock which doesn't lock, and other evidences of lack of attention on cars which run between large cities, we must conclude that it is about time for a shaking up somewhere in the management.

S. X.

The Problem of Stopping from Ninety Miles an Hour.

ERSKINE PARK, LENOX, Mass., Sept. 16, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

My attention has recently been called to an article relative to brakes and high speed trains in which I was quoted as the authority. In consequence of the errors in the article referred to, and the importance of the questions raised, I desire, through your columns, to state some important facts bearing upon the subject, to which I am sure railroad officers will give careful consideration.

By referring to the celebrated Douglas Galton brake experiments it will be seen that, with the brakes in the best possible order, acting upon all of the wheels of one vehicle and up to their theoretical efficiency, it was only possible to reduce the speed at the rate of about three and a half miles per hour for each second the brakes were applied until the vehicle stopped; and it was further found during these experiments that the higher the speed, the less the brake shoes retarded the wheels with a given force applied to them; and that at 60 miles and upward, the brake force to be thoroughly efficient would have to be at least double that now usually employed in daily practice at speeds below 50 miles. With trains of considerable length it was shown that, with the brakes in the most perfect order possible, trains could be brought to a stand from a speed of 60 miles an hour, within about 1,200 feet, the brakes in these cases acting upon about 95 per cent. of the weight borne by the wheels of the train.

With a *perfect brake*, acting upon all of the wheels of an express train running at 90 miles an hour, it will be seen from Table No. 1 that at the end of 10 seconds the train would still be moving at a little over 60 miles an hour, and would have traveled a distance of about 1,130 ft. As a matter of fact, with the brake force now fitted to trains, the reduction of the speed of trains running above 60 miles an hour would, under favorable conditions, not exceed two miles for each second.

Table No. 2 will show the distance run during each second after the application of the brake, *under the best actual conditions*, and at the end of 16 seconds the train would be running 61 miles an hour, and would have traveled in that time 1,796 ft.

It requires no more than to call attention to the fact that the human vision is limited to show the increased risk that is incurred running trains at 90 miles an hour, as compared with trains running at 60 miles an hour and under. A system of signals to provide for these high speeds would have to be absolutely perfect, and arranged at such distances apart that they would necessarily limit the capacity of the road for all trains that are run at a much lower speed, unless a double set of signals were provided, one for high speed and one for low speed.

The danger to a person crossing the tracks at a level with trains running at these high speeds would be multiplied many times, unless a system of gates were provided, with danger signals at nearly a mile from each crossing, which could only be lowered when the gates at the crossing had been properly closed; in fact, everything would have to be arranged so that nothing would be left entirely to the judgment of man.

It was the explanation of these points in a conversation, concerning the running of trains at high speed by electricity, with a writer of a daily paper, who was interested in the subject, which probably formed the basis of the article to which my attention has been called. It may, therefore, not be out of place in this letter to state a few facts which will bear with force upon the question of substituting an electric locomotive for the present steam locomotive.

Electricity on Standard Railroads.—The modern passenger locomotive, for high speed trains, must be capable of developing at least 1,200 H. P., and it costs about $10,000; that is, the engine, boiler, feed pumps, steam piping and everything necessary to produce motion cost about $8 per horse power. For the operation of a train by electricity, in place of one steam locomotive there would be required the following principal items, costing, according to present prices of electrical apparatus, approximately the figures set opposite:

A stationary steam boiler, 1,630 H. P.	$16,000
A stationary engine, 1,630 H. P.	18,000
An electric generator, 1,630 H. P.	25,000
Motor for locomotive, 1,400 H. P.	22,000
	$81,000

In addition to the above there would have to be added the proportionate cost of the buildings and outside electrical construction for the transmission of the electricity from the generator to the locomotive.

There are innumerable places where electrical power will profitably supplant the steam engine, but I feel confident that the above figures, or any modification that may reasonably be expected, will be a most serious obstacle to the utilization of electricity for moving standard railroad trains, even provided all of the mechanical details necessary for the transfer of electrical energy of 1,200 H. P. from a stationary to a moving object shall be satisfactorily worked out.

GEO. WESTINGHOUSE, JR.

TABLE NO. 1.

Speed	90 miles per hour.
Feet per second	132
Time lost applying brakes	One second, with full application at end of second second.
Reduction first second	0 miles.
" second "	1¾ "
" each second after	3½ "

With the above condition, the following figures are almost accurate (fractions omitted):

Seconds.	Feet traveled.	Speed at end of,
1st	132	90
2d	131—	86¼
3d	126—	84¾
4th	121+	81¼
5th	116+	77¾
6th	111+	74¼
7th	106+	70¾
8th	101+	67¼
9th	96+	63¾
10th	90+	60¼
Total run	1,130 feet in ten seconds.	

To obtain the above results upon dry rails and upon the level would require a brake force of at least three times the total weight of the train, and this should be properly distributed upon every wheel in the train, and there would be needed a device on each car to automatically reduce the brake shoe pressure as the speed decreased.

TABLE NO. 2.

Speed	90 miles per hour.
Feet per second	132
Time lost applying brakes	one second, with full application at end of second second.
Reduction first second	0 miles.
" second	1 "
" each second after	2 "

The best to be expected from present well-fitted trains, with brakes in perfect order, in speeds above 60 miles per hour.

Seconds.	Feet traveled.	Speed at end of	Seconds.	Feet traveled.	Speed at end of
1st	132	90	9th	111	75
2d	131	89	10th	108	73
3d	129	87	11th	105	71
4th	126	85	12th	102	69
5th	123	83	13th	99	67
6th	120	81	14th	96	65
7th	117	79	15th	93	63
8th	114	77	16th	90	61
Total run	1,796 ft. in 16 sec.				

Some Disputed Points in Bridge Engineering.

KANSAS CITY, Mo., Aug. 20, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In writing the résumé of my paper on "Some Disputed Points in Railway Bridge Designing" there was a point raised by Mr. Edwin Thacher which I would have liked to investigate, but time did not permit, nor have I since found leisure to do so. However, Prof. T. U. Taylor, of the University of Texas, who is spending his summer vacation in my office, has kindly volunteered to make the calculations for me. The point referred to in Mr. Thacher's discussion will be found on page 140 of the *Transactions* of the American Society of Civil Engineers. His discussion reads thus:

"If the train load precedes as well as follows

the engines, however, which is not uncommon, the stresses by uniform and wheel loads for spans of any length, including cantilevers, give results almost identical. . . . The author appears to have based his equivalent loads for all spans upon the maximum bending moment. I do not think it advisable to do this for spans exceeding 90 to 100 ft. in length, or for spans greater than the longest plate girder used. A latticed girder I would never use unless forced to do so, and for truss spans I consider it preferable to base the equivalent load on the maximum shear, in which case the stress in end brace and end chord by uniform load and by wheel loads will be identical, the stresses at centre of chords and in counters being slightly in excess by uniform loads. The results will vary somewhat with the number of panels used, so that in preparing a table for spans of 100 ft. and upward it would be advisable to give a choice in the number of panels."

I have been the more anxious to check these statements of Mr. Thacher's for the reason that a prominent Western engineer, who has lately been figuring on the subject of equivalent uniformly distributed loads, tells me that it is impracticable to find either an equivalent uniformly distributed load for any span that will give results reasonably close to accuracy, or to find a single uniform load headed by a single concentrated load that will give even as close results as the former method. This gentleman told me that the heavier the engine in proportion to the train the greater would be the discrepancy. This I had already anticipated, but did not imagine that it would be of any serious consequence. He was basing his calculations on two of Cooper's "Extra Heavy Class A" engines followed by 3,000 lbs. per lineal foot. As the percentages of error given in the tables of my paper do not change materially with the span length, I have concluded that in these investigations it will suffice to assume an average span length of 200 ft., and that it will be legitimate to conclude that what holds good for this span will also hold good for other spans.

The result of Prof. Taylor's calculations are given in the following tables:

EQUIVALENT UNIFORM LOAD FROM END SHEAR FOR 200 FT. SPAN FOR COOPER'S "EXTRA HEAVY CLASS A"=3,777 LBS. PER LINEAL FOOT.

Members.	Shear in pounds.		Percentage of error.
	By diagram.	By eq. un. load.	
End post	330,500	330,500	Zero.
First M. Diag	249,438	247,867	0.63 Danger.
Second M. Diag	179,522	177,049	1.38 "
Third M. Diag	118,897	118,034	0.72 "
First counter	67,620	70,822	4.73 Safety.
Second counter	31,887	35,413	11.05 "

EQUIVALENT UNIFORM LOAD FROM END SHEAR FOR 200 FT. SPAN FOR COOPER'S "CLASS A"=3,221 LBS. PER LINEAL FOOT.

Member.	Shear in pounds.		Percentage of error.
	By diagram.	By eq. un. load.	
End post	281,874	281,874	Zero.
First M. Diag	209,992	211,398	0.67 Safety.
Second M. Diag	148,784	150,998	1.49 "
Third M. Diag	97,484	100 645	3.24 "
First counter	55,768	60,400	8.32 "
Second counter	26,220	30,200	15.18 "

Professor Taylor obtained the end shear without any cars ahead of the train, for, in fact, there could be no car wheels on the bridge for the position of pilot wheel giving maximum end shear, but for all panels except the first he assumed that the cars preceded as well as followed the engines. Adopting the equivalent, uniformly distributed load corresponding to the end shear, the greatest safety errors in chord stresses amount to 5.5 per cent. for "Extra Heavy Class A," and 3.66 per cent. for "Class A"; and there are no percentages of danger on chords in either case. An inspection of the last column in each table shows that for end posts and main diagonals the coincidences of stresses by the approximate and exact methods are fairly close, but that other equivalent loads can be chosen which will reduce the percentages of error and distribute them more satisfactorily.

The following tables, prepared also by Professor Taylor, show this very clearly.

EQUIVALENT UNIFORM LOAD FOR 200 FT. SPAN FOR COOPER'S "EXTRA HEAVY CLASS A" = 3,750 LBS. PER LINEAL FOOT.

Member.	Shear in pounds.		Percentage of error.
	By diagram.	By eq. un. load.	
End post	330,500	328,125	0.71 Danger.
First M. Diag	249,438	246,094	1.34 "
Second M. Diag	179,522	175,781	2.08 "
Third M. Diag	118,897	117,187	1.44 "
First counter	67,620	70,312	6 89 Safety.
Second counter	31,887	35,156	13.22 "

In the last two tables the greatest safety errors for chords are 2.21 per cent. for the "Extra Heavy Class A," and 2.06 per cent. for "Class A;" and there are no danger errors in chords excepting in the two end panels of the bottom chords, where, of course, the errors are the same as those for the inclined end posts.

EQUIVALENT UNIFORM LOAD FOR 200 FT. SPAN FOR COOPER'S "CLASS A" = 3,170 LBS. PER LINEAL FOOT.

Member.	Shear in pounds.		Percentage of error.
	By diagram.	By eq. un. load.	
End post	281,874	277,375	1.60 Danger.
First M. Diag	209,992	208,031	0.93 "
Second M. Diag	148,784	148,594	0.11 "
Third M. Diag	97,484	99,063	1.64 Safety.
First counter	55,768	60,438	6.72 "
Second counter	26,220	30,719	13.58 "

The conclusion which I draw from Professor Taylor's investigations is that Mr. Thacher's claim that the best equivalent uniform load is the one obtained from the end shear is not warranted, but that it is practicable in any case to so adjust the equivalent load as to keep the errors, or variations from exactness, within satisfactory limits. It is clearly shown by the tables that the greater the difference between the average weights per foot of engines and cars in any train loading, the greater will be the percentage of error. In my opinion, though, the said difference will seldom be found greater than that which exists in Cooper's "Extra Heavy Class A" loading.

Have we not all of us of late been attributing too much importance to the difference in weight per foot of engines and cars in trains for mountain roads? Of course, on such roads the engines have to be heavy, and the total weight hauled must be comparatively small. But what authority have we for saying that the car loads also must be small? Is it not more likely that the weight of the train will be reduced by curtailing its length than that the same effect will be accomplished by underloading the cars? Cars loaded heavily in the East, where grades are light, are often transported to the far West over mountain roads; and there is no reason for believing that any mountain road will not at any time carry full, though short, train loads of these heavily loaded Eastern cars. On this account it might be well to have no special standard train loads for mountain lines, but to use for each road that class of my proposed standards having engines most nearly identical with the heaviest employed on the line.

This, however, is a question to submit in the circular which I purpose sending to railroad and bridge engineers, and concerning which I spoke in my last communication.

Referring to Mr. Thacher's remark to the effect that in preparing a table for spans of 100 ft. and upward it would be advisable to give a choice in the number of panels, I do not agree with him, for it would be much simpler to assume an average panel length of 25 ft., as I have done throughout my investigations. Any ordinary deviation from this length would cause no variation in equivalent load that would be worth taking into account.

In preparing my promised diagrams for the standard train loads, which, I hope, will be adopted by the profession, I shall prepare three only. The first will show total end shears for all spans up to 100 ft. The second will give equivalent uniformly distributed loads per lineal foot obtained from maximum bending moments at centres of spans for all plate girder spans up to 100 ft., and the third will give properly interpolated, equivalent, uniformly distributed loads per lineal foot for all truss spans from 100 to 500 ft.

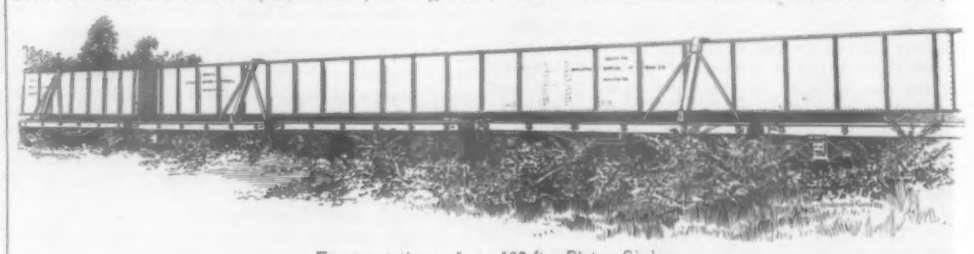
J. A. L. Waddell.

Big Plate Girders by Rail.

The plate girder shown in the accompanying illustration is one of four making probably the largest shipment of this kind ever made by rail. They were made for the counterbalanced, double-track drawbridge of the Norfolk & Western Railroad, over the Dismal Swamp Canal, eight miles west of Norfolk, Va. The shipment was made by the builders of the bridge, the American Bridge & Iron Co., of Roanoke, Va., on Aug. 1, and the illustration is from a photograph of part of the train. The long arm of the drawbridge is 76 ft. 6 in. and the short arm 43 ft. 6 in., so that each of the two girders near the centre of the bridge is 120 ft. long over all, and the outer girders are each 119 ft. long, owing to the curvature of the ends of the bridge. The girders are 7 ft. deep. They were shipped 250 miles by rail over the track of the Norfolk & Western without mishap, and by Aug. 17 were in position on the centre pier of the bridge. The transportation of this work took 16 platform cars, or four to each girder, and the train passed through a tunnel at Lynchburg on an eight degree curve.

The old draw replaced by this new one was built by Mr. Albert Fink about 1855, and was too light for modern rolling stock. Another historical fact of great interest connected with this is, that the Dismal Swamp Canal was located by Washington in his youth, and it extends to Lake Drummond, where Tom Moore's young woman paddled her white canoe. The old draw was built to let her craft and others pass.

The American Bridge & Iron Co. built the entire new work, both substructure and superstructure. The centre pier is a cast iron cylinder 24 ft. in diameter, resting on piles filled with concrete with a 20-inch granite coping. Mr. Charles C. Wentworth, M. Am. Soc. C. E., is the engineer of the work.



Transportation of a 120-ft. Plate Girder.

The Terminal Station at the World's Fair Grounds.

In the *Railroad Gazette* of Sept. 16 we illustrated the general arrangement of the tracks for the terminal station at the World's Fair Grounds. In this issue we show the floor plans of the two principal floors of the main building of the terminal station. As noted in a recent issue, the contracts for a large part of the construction have been let. The building is to cost $225,000 and it is expected that 25,000 persons can be accommodated at one time. It will be three stories high, 458 ft. long by 162 ft. 10 ins. wide and of a style of architecture which is harmonious with the other buildings in its vicinity. Our illustrations show the plans of the first and second floors, and the arrangement of the different waiting rooms, restaurant, lunch room, writing room, smoking room, etc., is so clearly shown that further description is unnecessary. The third story will be devoted to offices for various purposes, the Custom House Department being included.

The station of the intramural elevated railroad, as shown in the plan, is over a portion of the train shed. The details for the construction of the train shed have not yet been prepared.

Railroad Sanitation in Time of Cholera.

BY SAMUEL W. LATTA, M. D., *Chief Medical Examiner, Pennsylvania Railroad.*

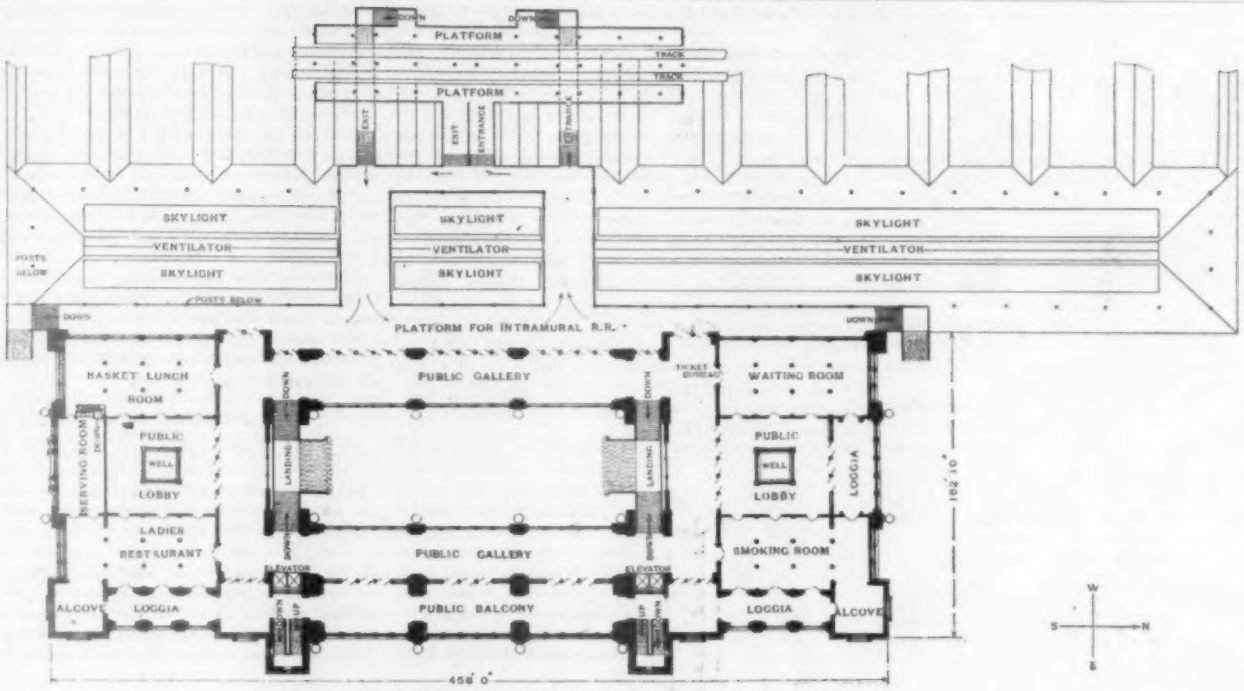
As the spread of cholera follows lines of travel, it becomes important that proper sanitary precautions should be taken by transportation companies with a view to lessen as much as possible the danger of extending the infection. Much can be done by organized efforts, properly directed, to prevent or stamp out such epidemics. While cholera is not contagious in the strict sense of the term, its poison is, of all deadly diseases, the most easily carried and disseminated. Cleanliness is the great enemy to cholera, and a proper regard for this is imperative. But the term as understood by the public and by sanitarians admits of a wide range of difference. The following hints are offered to railroad companies in view of the actual danger of an epidemic of cholera next year if not this.

Yards.—In each large freight yard a garbage car should be stationed for the purpose of receiving and removing accumulated filth and garbage. One man should be specially detailed to clean up the yard *constantly*. Particular care must be given to loose straw, decayed vegetables, rotting fruit, horse droppings or any other such dirt, which should be collected on a barrow and deposited in the garbage car, using copperas and carbolic acid freely as disinfectants. When the car is loaded it should be transported to some selected place where its contents should be burned or buried.

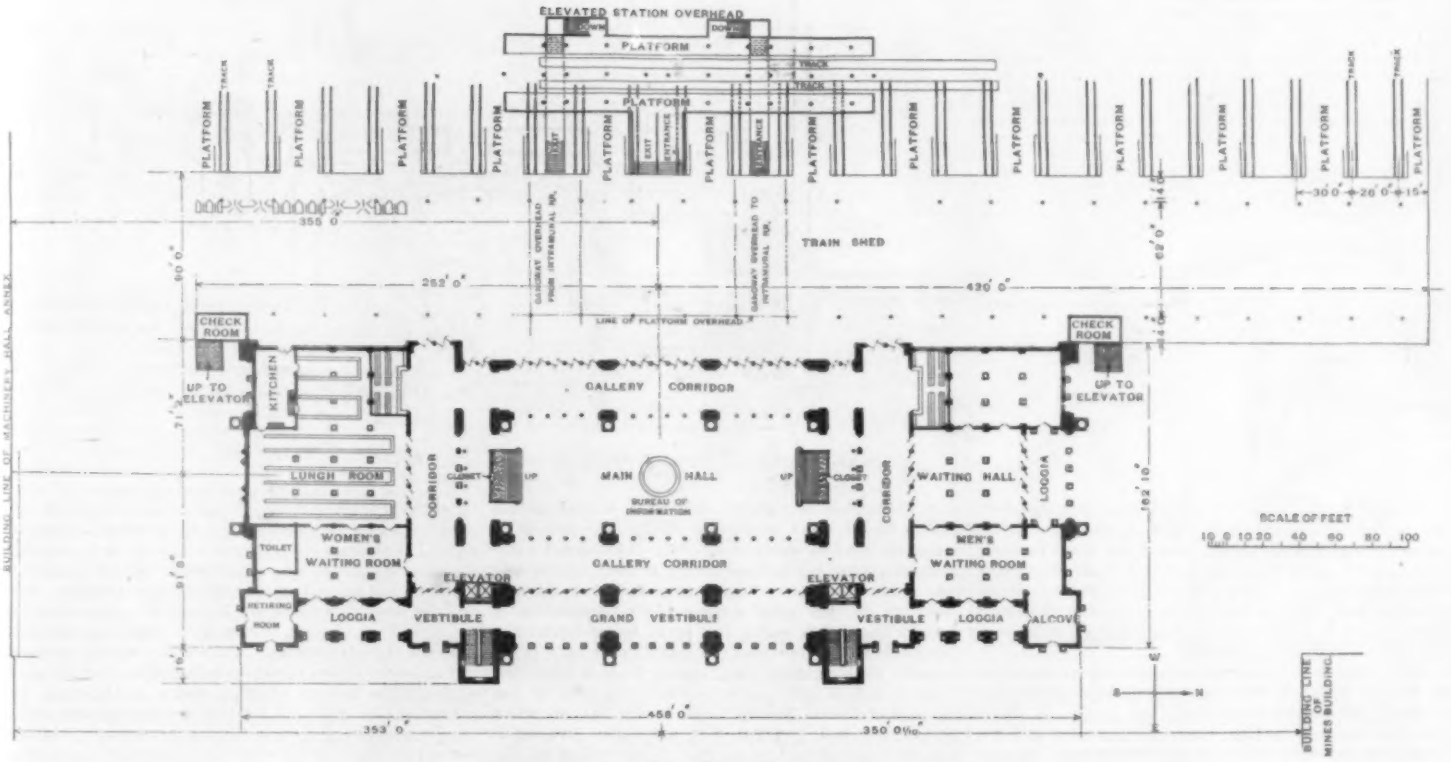
Wherever coal chutes exist care should be taken to see that the spaces beneath them are not used as urinals or privies, as is often the case. If they have been so used the accumulations must be removed, buried and the spaces where they had been carefully disinfected.

Tracks.—All accumulations of filth along the roadway must be removed and burned. All weeds should be cut and similarly treated. Drains should be kept clean, and the fall made sufficient to carry off the drainage, avoiding carefully stagnation. If drains are foul they should be cleaned and disinfected with copperas and carbolic acid. Drains should not be turned into water courses likely to be used for water supply of towns, but preferably into fields where the drainage can spread itself over considerable area without washing a gully. The earth will act as a disinfectant and germicide.

Stations.—Stations should be kept scrupulously *clean*. Floors should be scrubbed daily, or oftener, with disinfectant soap and boiling water. Seats should be wiped off with a solution of corrosive sublimate. Doors and particularly door knobs and such parts as come in con



Second Floor Plan.



First Floor Plan.

WORLD'S COLUMBIAN EXPOSITION—TERMINAL RAILROAD STATION.

Mr. C. B. ATWOOD, *Designer-in-Chief.* *Mr.* D. H. BURNHAM, *Chief of Construction.*

fact with persons hands should be treated to an ablution of the same solution. Walls, ceilings and windows should be frequently cleaned, preferably washed. All accumulations of dust must be carefully removed and *burned*. If spittoons are used they should have a quantity of sublimate solution placed in them before being used and when cleaned, which should be done frequently, their contents should be burned. Waiting rooms should be thoroughly aired twice daily. No carpets or rugs should be allowed in these rooms. Spaces beneath platforms should be cleaned, fresh lime sprinkled in them and arrangements made for a free circulation of air in such spaces. Cellars beneath buildings must be cleaned thoroughly, and walls whitewashed. These spaces should be dry and have a free circulation of air through them.

Water Closets.—All cesspools and privy vaults should be thoroughly cleaned out, disinfected and filled up with fresh earth. In place of them earth closets should be substituted, where there are no public water supply and sewers, as at most country stations. An arrangement can be adapted to the privy building for this purpose by having boxes made with calked seams to fit beneath the seats, so made as to be removed through the back of the building. When full the box should be removed at night, by the work train, to a designated place. The space beneath the seats should be ventilated by a pipe leading up through the privy roof. In each privy should be placed a box of dry earth and a small shovel with a placard over the box directing those using the privy to throw a quantity of earth on the deposit. Some copperas may be mixed with the earth.

The contents of the receptacle for excrement should be disenfected daily with copperas and carbolic acid, and most important of all, *the agent should be held responsible for the proper observance of those rules.*

No cesspools or privy vaults should be permitted along the lines of any railroad.

Where water-closets are connected with sewers the traps should be frequently inspected to see that they are intact. These closets should be flushed frequently and copiously, and a disinfecting fluid poured down them twice daily. Urinals should be kept scrupulously clean, disinfected twice daily, and care taken that a good stream of water constantly passes through them.

Both water-closets and urinals should be daily scrubbed with soap and boiling water. (There should be an attendant in charge of water-closets at large stations.) Floors, sides and seats should be washed often with a solution of some disinfectant after being scrubbed These places should have thorough ventilation with a free circulation of air at all times, and be constructed in accordance with the latest and best sanitary plumbing appliances.

Cars.—The utmost vigilance is necessary to prevent these becoming carriers of infectious material. All carpets, curtains and rugs should be removed from them and *kept out*. Car floors should be thoroughly scrubbed with disinfectant soap and boiling water on arrival at terminals. Cushions and seat backs should be beaten. If seats were covered with oilcloth or leather they would be preferable to and healthier than plush. Cane seats are preferable to either. The sides, within the cars, windows and doors should be washed with a solution of corrosive sublimate. All doors, windows and ventilators should be thrown open and kept so while cars are not in use so that they can be thoroughly aired. Water coolers should be scalded out from the top through the opened stopcock in the bottom.

Water closets in cars as now arranged are the great source of danger, as the excrement dropped on the track may contain cholera or other disease germs, be washed into running streams and infect whole towns.

Therefore those now in use should be changed. In place of the present plan an earth closet should be substituted as follows: Cut off the outlet tube at the floor of the car, fit a water tight box beneath the car floor on cleats, so it will slide and can be drawn out at the side of the car, fastening it, when in place, by some proper appliance. Have a small box of dry earth, mixed with coperas in each closet, and a shovel in the box, fastened

with a chain and directions over the box, as in the privy hereinbefore described. Upon arrival at end of a run, withdraw the box, haul it away to the garbage deposit place, substituting a clean and disinfected one.

The *train conductor* should be held responsible for the proper use of the closet. The brakeman should frequently inspect it to see if the earth is being used and should put some in if necessary. The box could also be used as a urinal. The closet rooms should be thoroughly cleansed and disinfected when the car is out of service. All dirty clothing and other materials likely to breed disease left in cars should be burned immediately.

Should a case of suspected disease occur in a car the other passengers should be removed promptly, the car sidetracked, the sick person isolated and the car should not be used again until it has been thoroughly disinfected under the directions of a competent sanitarian. This same rule may apply to any station whereat a case of suspected contagious disease may occur.

Lavatories.—All shops, stations and other places where large numbers of men are employed should be supplied with means for personal ablutions. Where employés can surely work out this much desired sanitary improvement.

Personal Cleanliness.—As before mentioned, the cholera germ gets into the body through the digestive tract entering the stomach, from which it gains access to the blood. It will not live without filth. Dry heat kills it. If there is neither moisture nor dirt for it to live in and on it will speedily die. The surest way to kill it is by fire. Lacking this, the best plan is to starve it to death by depriving it of its required food—*filth*. Therefore we see the necessity for cleanliness—means should be supplied to railroad men for lavation and baths. The hands should always be washed before eating.

The Transportion of Emigrants.—Cholera germs, leading to epidemics, are usually spread by emigration. From the origin of an epidemic on the banks of the Ganges, all along the pilgrimage to Mecca, its usual route, to its landing on our shores, this class of people are its carriers and promoters. Their ignorance, dirty, filthy habits, carelessness, all aid in making them victims of the cholera.

Railroad companies are compelled to carry immigrants and become indirectly and innocently the means of spreading the disease throughout the country. Too much care cannot be exercised in moving them. None should be received on trains without clean bills of health, for person and baggage, from quarantine offices. Each piece of baggage or bale of rags from abroad should have a health label, signed by the proper authority, pasted on it before being received by the railroad company, and these regulations should be kept up for one year after the cholera has disappeared from Europe, inasmuch as the great danger of its importation is through baggage or rags. The germ, being dormant in the cloths, will revive upon the baggage or bale being opened. Each emigrant train should have a physician whose duty it should be to have a watchful care for the first sign of disease among those in his charge, when the victim should be isolated in a hospital car, numbers of which should be at convenient points; all discharges disinfected and buried. The car floor should be carefully disinfected all soiled clothing burned, and the car taken from the train and properly disinfected.

Remedial Supplies.—During an epidemic, supplies of proper remedies, such as the *Sun* cholera mixture, sulphuric acid lemonade, etc., should be kept on trains, at stations and in offices. Large quantities of disinfectants should be placed at convenient places with proper directions for using. Means for disinfecting cars should be kept at terminal points in charge of persons instructed in their use.

Inspection.—All rules for sanitary reforms will be of little or no avail unless *constantly* followed by the strictest inspection by sanitary experts. Orders may be issued to clean up yards, stations and cars, but unless expert sanitarians are employed, with delegated power to enforce proper precautions and to see that all sanitary requirements are fully and completely met, the efforts will have been vain.

Constant vigilance by those qualified to judge alone results in sanitary success and reform, and we cannot too strongly urge upon our transportation companies the great necessity for such inspection at this time. Clothe these inspectors with proper authority and much good may be done and much money saved. While it is probable we may escape a serious epidemic of cholera this fall, *unless the strictest sanitary requirements are enforced all through the winter and spring, the dread disease will be a most unwelcome visitor next summer.* Such is the teaching of history. The millions spent for the Columbian Exposition will then have been so many millions thrown away.

The exercise of strict sanitary rules during the period mentioned will well repay all our great transportation companies, and enable them to realize on the outlay of money preparatory to the expected increase of traffic next year. Money spent for sanitary inspection will be well invested and realize a large return.

How to Avoid Taking the Cholera.—Railroad employés required to handle infected baggage or even cholera victims need not fear contracting the disease if they are careful not to put their hands into their mouths until after they have been thoroughly cleansed. Do not fear the disease. When possible avoid night air. Live regularly and temperately. Avoid cold drinks and fruit of all kinds. Eat nothing except it is well cooked. Drink only boiled water. Sleep each day fully seven hours. Keep the feet warm and dry. Have the body clean. Bathe daily in boiled water. If attacked with painless diarrhœa, or even looseness of the bowels, take a cholera mixture until cured.

The Kinsman Block System.

There can be little doubt that one great reason why the block signal system—that is, a space interval system—has not been more generally adopted in this country is the feeling among railroad managers that when they make a change they wish to avoid *all* the evils of the old system. This has been regarded as practically impossible for the reason that the carelessness of engineers in not heeding signals remains a great evil under the space interval as well as under the time interval system. Managers sometimes allow the arguments pro and con on this question to shut out of their minds many other important considerations. The principal check on the possibility that an engineer will fail to observe a visual signal, that has been hitherto proposed, is an audible signal: and this has been put in use to a limited extent. Many switch signals on the Manhattan elevated road and the block signals in the Fourth avenue tunnel, on the New York Central, in New York City, are equipped with the Palmer torpedo. The audible signals are used as auxiliaries to the visual signals, but they are to guard against quite remote dangers, and are, therefore, regarded as expensive. All audible or other systems which require a bell or whistle on the engine, or any special device for communicating with the road bed or the signals fixed at the side of the road have failed to find favor for the reason, chiefly, that railroad managers would not adopt a radical innovation which required the equipment of every locomotive on the road with a special device. The danger liable to result from the running of a train over the road without a specially equipped engine is regarded as too great to be incurred.

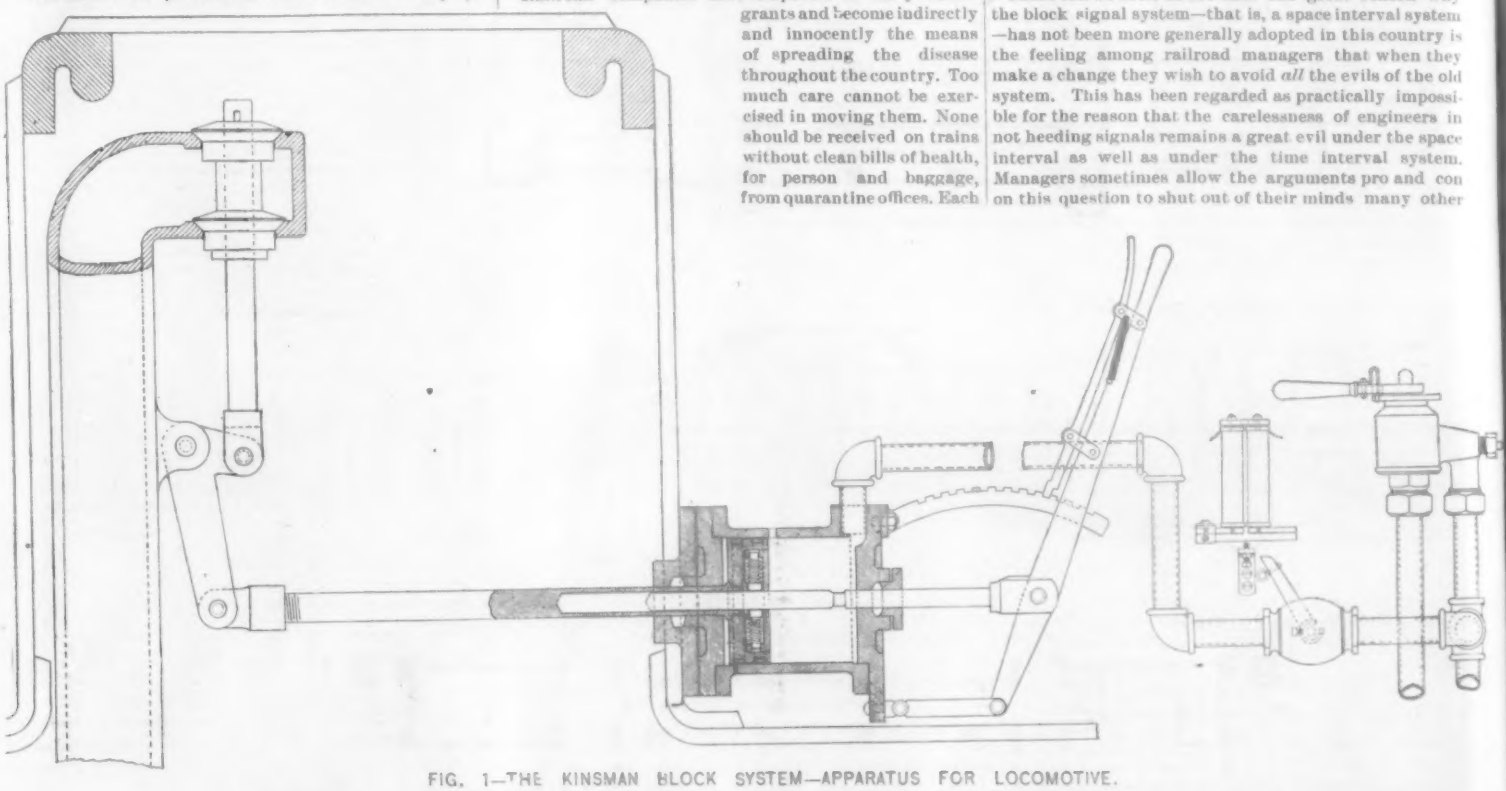


FIG. 1—THE KINSMAN BLOCK SYSTEM—APPARATUS FOR LOCOMOTIVE.

But this danger is not feared by every one, and the company whose name heads this article is now equipping 26 miles of a prominent road entering Chicago with apparatus for operating its system for stopping a train at any prearranged point without the intervention of the engineer, and we show in the accompanying engravings the principal apparatus for doing this. As this system is entirely automatic and gives no signal of any kind to the engineer except the incidental one produced by the sound of the escape of air in applying the brakes, the company takes pains to speak of its device as a block system, not a block signal. The drawings require but little explanation. The setting of a visual signal at danger throws an electric current into a rail fixed, like an ordinary guard or check rail, on the sleepers of the main track opposite the signal post. On the approach of a train an electrical connection is made between this electrified rail and an electromagnet in the cab of the locomotive, whose armature, when drawn up, operates to close the throttle of the locomotive, and apply the air brakes to the whole train.

Fig. 1 shows a conventional arrangement of the throttle valve, throttle lever and air brake valve of a locomotive. The apparatus for automatically stopping the train is fixed between the gland of the throttle lever and the

boiler head. The pipe connection between the air brake-valve and the electro-magnet, for automatically stopping the train, is clearly shown. When this apparatus is applied to an engine the throttle lever is fixed in the usual horizontal or nearly horizontal position, and the air brake valve is in its usual place. The electro-magnet is fixed where it will be out of the way.

The lifting of the armature of the electro-magnet opens the air valve by means of the trip, as will appear from a comparison of fig. 2 with fig. 1., and admits air from the train pipe to the cylinder surrounding the spindle of the throttle lever. This air pressure forces the piston in that cylinder to the left, thereby closing the throttle valve and shutting off steam from the cylinders; but the *inner* spindle, which is fastened to the throttle lever, remains stationary; the outer portion or sleeve of the spindle is forced to slide along upon the inner, the air pressure overcoming the power of the springs by which the piston is held against the neck of the inner spindle. There are four of these springs, two at right angles to the two shown, and they hold the piston to the spindle with sufficient force to keep it fixed so as to hold the outer and inner spindles together during all the ordinary manipulations of the throttle by the engineman. The throttle lever can therefore be kept locked at all times, the same as though the automatic apparatus were not there. After a train has been stopped, or the road is clear so that it may proceed, the engineman, by pushing on the throttle lever forces the inner spindle forward so that the piston resumes its former position on the neck of that spindle.

After the piston has been pushed beyond the port opening to the atmosphere, which is shown in the upper side of the cylinder, the air escapes from this port and applies the brakes, in the same manner as would the opening of the train pipe at any other place. This port is made of a size suitable to produce an ordinary application of the brakes. The proper place to apply a stopping apparatus like this is, of course, at the distant signal, or at any rate at some distance back of the point of danger, and there is therefore no necessity for making what we call in air brake practice an emergency stop; but to provide for making a sudden stop, the size of this port is made adjustable so that it can at any time be instantly enlarged by the engineer, a light lever for this purpose being fixed where he can conveniently press it with his foot.

The electric rail is placed at the usual distance from the track rail, 1¾ in. The arm for making connection with it is fixed to the equalizer of the locomotive truck and is jointed a little below the middle of its length to provide against breakage by possible obstructions. It is held in position to press against the rail by a strong flat spring, as shown in the transverse section of the truck (fig. 4). The arm rubs against every guard rail it passes, but this has no effect on the maguet, of course. The electrical rail is spiked to the ties without special insulation.

In setting forth the merits of this system the officers of the company lay particular stress on the fact that the metallic arm, for making the electrical contact between the apparatus on the locomotive and the rail fixed on the roadway, runs in the flangeway, so that it is no more liable to obstruction than is the wheel itself. All schemes for using a fixture fastened between the rails, to rise higher than the top of the rail, or for fixing apparatus of any kind at some point outside the rail, have developed objectionable features which the Kinsman plan avoids. As noted above, any signal of this kind should act some time before the train reaches the point of danger; but with any apparatus which, like the torpedo signal, uses up material every time it is used, this principle involves considerable expense for care and maintenance. The Kinsman system avoids all difficulty on this point because the brakes are not only applied with moderate force, so as to avoid unpleasant shock in the cars, but the engineman can at once release them after they are applied. There is, therefore, no obstacle to using the system even where trains have to frequently pass distant signals which are set against them. More than this, the runner can, if he choose, hold the armature of the magnet down (open) with his finger, on approaching the contact rail, so that the automatic apparatus will not work at all. To claim this advantage is, of course, to admit that a malicious or mischievous engineman can throw the apparatus entirely out of action during a whole trip if he see fit; but the inventor says that he makes no pretension that the devices which we illustrate will outwit an evil disposed runner.

This system can be used in conjunction with any of the existing systems of signals. It can also be used without a visual signal. By putting a suitable device on the locomotive it can be used to give a positive safety signal, the electric current being conducted from the visual signal (or its equivalent) to the contact rail during the existence of *safety*, and withdrawn, so as to give no signal, when the condition changes to *danger*.

This apparatus has been carefully tested for nearly three years on the Peterboro & Shirley division of the Hoosac Tunnel Route, near Ayer Junction, Mass., and all the details seem to have been carefully perfected. The address of the Kinsman Block System Company is 143 Liberty street, New York City.

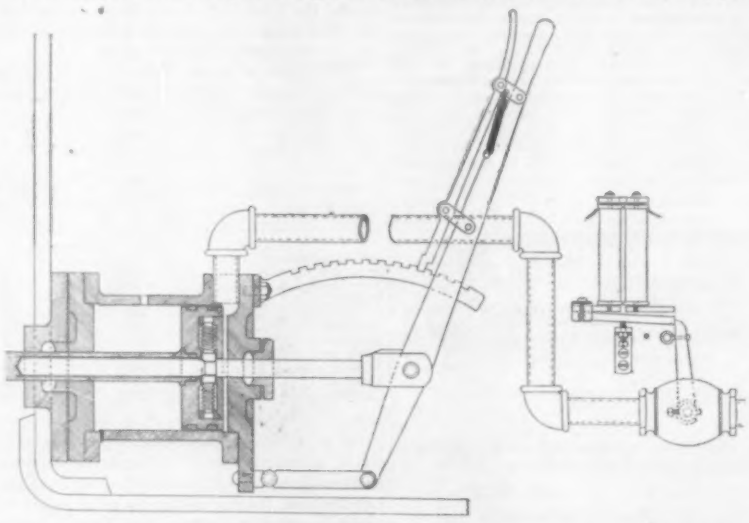


Fig. 2—Engine Running, Throttle Valve Open.

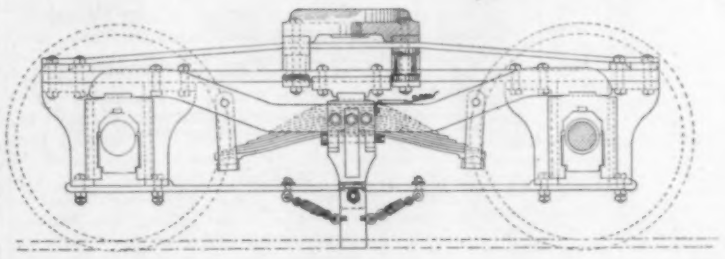


Fig. 3—Electrical Connection Attached to Truck.

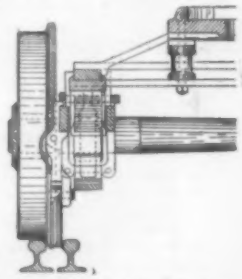


Fig. 4—Showing Electrical Arm in Contact with Electrified Rail.

Dating Tickets by Perforation.

Mr. W. A. Thrall, General Passenger Agent of the Chicago & Northwestern, who shows a constant fertility in new devices, has adopted a new scheme for limiting local tickets more securely than by the ordinary means. We show herewith two engravings illustrating the appearance of tickets as punched by his apparatus. In the sample shown "244:2" indicates the 244th day of the year 1892. The figures as shown in cut No. 1 illustrate the appearance of the *back* of the ticket. On the front of the ticket (cut No. 2) the figures are reversed, but they are not to be read on this side. We show cut No. 2 for the purpose of pointing out what, so far as we can see, is the only objection to the system, and that is the partial obliteration of the printed matter on the face of the ticket. The ticket in our cut does not show this at its worst, as it has considerable blank space. Another sample which we have seen is somewhat difficult to read. It is true that this difficulty can often be regarded as of no practical importance, and that conductors are in the habit of reading all sorts of illegible and mixed-up matter on tickets; but it is true, nevertheless, that in many cases a partial obliteration like this will add one more difficulty where there are already too many. Conductors excuse themselves for mistakes on the ground that tickets are not clearly printed.

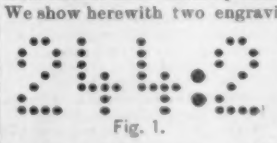


Fig. 1.

Mr. Thrall has issued a circular to his connections setting forth the advantages of this device. The invention has been called out, of course, by the rapid spread of the custom of limiting local tickets to one day from date of sale. The date shown in the present samples is, by the way, the date of sale and not that of expiration. Mr. Thrall finds that a date printed with an ordinary stamp is easily effaced or changed. The day of the year was adopted because it requires fewest figures; it was necessary to have the figures large to afford a thorough protection. A pocket calender is printed and circulated, by which the day of the year can readily be found, and Mr. Thrall also issues a "perpetual" table, 1¾ × 3 inches, by which the day of any year can be quickly found by adding the day of the month to a certain number shown in the table. These little circulars are given out to inquiring passengers. The Northwestern continues to use the L punch on all limited coupon tickets.

Fig. 2.

The "Brain" Electric Conduit System.

We had this week an opportunity of witnessing some trials made with an ingenious form of closed conduit for tram lines, proposed by Mr. C. T. B. Brain, in which he has endeavored to overcome certain difficulties inherent to the open slot system as used at Blackpool.

As regards the open-slot system, the objections to its use are not so much due to difficulties with conductor insulation—as this can be well maintained through average weather—as with those arising from the small and weak collector or connecting arrangements of each car, which travel through the narrow slot on the surface of the roadway, and those arising from the difficulty of access to the conduit when repairs have to be made.

To remedy these defects, Mr. Brain builds his conduits with a comparatively wide slot in the centre of the track, and then covers the opening with a stout steel rail lying flush with the surface of the roadway, while, to enable the collector attached to the car to come in contact with the cable lying in the centre of the conduit, this cover rail is raised from its seat as the car passes over it by rollers, which pass underneath the rail, and which are securely fixed in the carrier frame.

The turn-outs and crossings are worked automatically by a very simple and ingenious arrangement of bell-crank levers actuated by the car wheel, which depresses a projection in the groove of the rail, provision being made to cut such switching action out of gear when the car is returning in the reverse direction to the one in which it is desired that the turn-out shall be actuated. The advantage of this arrangement of automatic switching is that there is only one path for the collector to take, and therefore no liability of the car going in one direction and the collector another. During the trial the car was run several times, in both directions, over the track, and the switching arrangements worked exceedingly well.

The conduit consists of a solid cast iron trough, the lengths being strongly fitted into each other at both ends, and the whole firmly bedded on the concrete foundation of the roadway; the slot at the top is 1⅝ in. wide, and thus affords room for a collector of very substantial design. The cable or conductor is solid and of circular section, supported at intervals on suitable arms carried by insulators fixed in small boxes at one side of the line, and arranged so that the insulators can be easily got at and cleaned without in any way interfering with the working of the line. At the turn-outs and crossings the cable is made of square or flat section, the contact with the collector being made by a constant downward pressure maintained against the conductor. The conductor is of substantial design, well insulated from the cast iron conduits, which form the return, and the wearing parts are simple and easily renewable. The slot in the conduit is closed by a cover rail 2 in. wide by about ⅛ in. thick, weighing under 3 lbs. per foot. This rail is raised about 1½ in. by the collector as the car passes over it, and falls back into its seat within a few feet on either side by its own flexibility. The power absorbed in raising the cover rail and dragging the collector along is very small, and at a speed of 600 ft. per minute, would not, under the most adverse circumstances, exceed $\frac{1}{10}$ to $\frac{1}{15}$ H. P. As regards accessibility for cleaning and repairs, the "Brain" conduit has many advantages, as by a slight adjustment of the rear roller of the collector the cover rail is laid on one side of the conduit, thus instantly opening up the whole of the conduit for inspection, while, by reversing the car, the cover rail is as quickly replaced in its seat in working order.

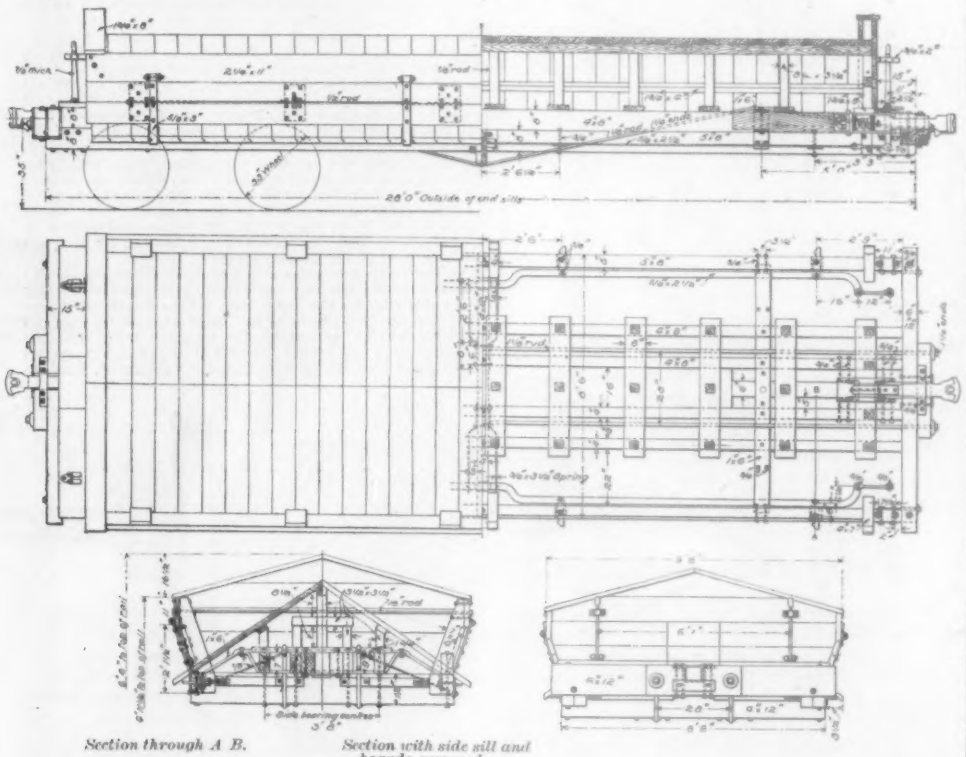
The trial runs which we witnessed were very satisfactory, and passed off without a hitch of any kind. The engineering features of the line have been very well worked out, and as the cost is stated by Mr. Brain to be exceedingly moderate—in fact, not more than a well-equipped overhead line—we think that further will be heard of the system in the future. The experimental track has been in operation for the past two years and has worked satisfactorily in the worst weather. We hope to give some illustrations of it in an early issue.—*Industries.*

Chesapeake & Ohio Stone Car.

The Chesapeake & Ohio Railway has in use a class of stone cars which have some particularly interesting features and which are clearly shown by our illustrations. It will be noticed that the car can be unloaded by means of the levers and connections as shown, in one-quarter, one-half, three-quarters, or full carload lots almost instantaneously. This feature is, of course, important where a small quantity of ballast is required; the ballast being taken care of by the regular section force wherever distributed. The Chesapeake & Ohio has 40 of this class of cars in service and we are informed by Mr. Wm. Garstang, Superintendent of Motive Power, that they have given excellent satisfaction. They are handled almost exclusively by local freight trains, thus avoiding the expense of running a work train. The cars are loaded at the stone crusher and unloaded by the regular freight train crew according to instructions, and after unloading are set off and picked up by the local freight going in the opposite direction and taken back to the stone crusher or gravel pit.

The Construction and Working of the State Railroads of Bosina and Herzegovina.*

By the construction of the last mountain section of the main line through the provinces of Bosnia and Herzegovina, from the Hungarian trunk line to the shore of the Adriatic, the imperial policy of the introduction of higher civilization, the development of the natural resources and commercial capacity of the country and efficient military protection and control, is at length in a position for realization.



Section through A B. *Section with side sill and boards removed.*

CHESAPEAKE & OHIO STONE CAR.

The Bosnian State Railway starts from Bosnisch Brod and runs southward along the Ukrina Valley from Novoselo to Dervent, crossing the watershed between the Save and Bosna, the summit of which is attained at Han Marica, at a height of 890 ft. above sea-level. The chief points on the route are Doboj, Maghaj, and Zenica, the latter being the termination of the first section of the line. The guage which, although it was originally laid as a temporary measure, withthe intention of conversion later to standard gauge, has since been adopted for the whole of this railway system, is 25 in., the formation width being 8 ft. 3 in. The cost of the construction and equipment was £2,800 per mile. From Doboj, a branch line 4½ miles in length, is constructed to Siminhan, through easy country; while another line from the same point runs up the Usora Valley to a distance of 25 miles. The latter was built especially for the development of the timber trade of the district.

The next section of the main line, from Zenica to Sarajevo, a length of 50 miles, was constructed as a strategical line, and, on account of the heavier work required, cost £6,600 per mile.

The first engines put on the line were from 20 to 60 H. P., but the development of traffic soon necessitated considerable improvement and increase of the rolling stock. The engines now running are of 200 H. P., and are capable of taking a train of 150 tons up inclines of 1 in 72, and of attaining a speed of 31 miles per hour without perceptible oscillation, so that no doubt whatever can be felt as to the suitability of the gauge for such speeds.

A branch line 13 miles in length, and with maximum gradient of 1 in 40, runs from Vogosca to Cjevljanovic. Beyond Sarajevo the construction of the line was commenced from the Dalmatian coast. The Herzegovina is a mountain fastness intersected by one valley only; so that this presented the only route available. The Narenta flowed out to the sea, before the execution of the improvement works, through a network of shallow irregular channels across a tract of malarial ground, and only the smallest coasting vessels, even under the most favorable circumstances, could ascend to Metkovic. The works, which cost over £600,000, not only effected the reclamation and sanitation of this tract of land, but deepened the main channel, so that vessels of 500 tons can now reach Metkovic at any time. This place, 12 miles from the coast, is the starting point of the line. The first section constructed, 26½ miles in length, extended to Mostar, the capital of the province. The construction presented no great difficulties, the maximum gradient being 1 in 300, and minimum curve 5 chains radius, with 69.4 per cent. of the length straight. The only iron bridge of importance is one of 164 ft. span over the Trebezat. The cost per mile was £5,360. Beyond Mostar, on the line to Ostrozac, the mountain summits rise 6,000 ft. above the valley, and for a length of 20 miles the line follows the gorge of the Narenta, crossing the Drezanka by a bridge of 180 ft. span, and the Narenta itself by a span of 197 ft. For a length of two miles the cliffs rise straight from the river to a height of 2,000 ft., and nearly every yard of the line had to be blasted out of the solid rock. Through a short tunnel at Glogosnica the line runs down an expanding valley between peaks rising to a height of 7,000 ft., crosses the Narenta again at a height of 130 ft. above the water with a span of 246 ft., to Jablanica, and thence, still following the Narenta, to Ostrozac, which was the provisional terminus till 1889.

The remaining link, from Ostrozac to Sarajevo, crosses the Ivan pass at a height of 2,880 ft. above the sea; the mountain section, on the combined adhesion and rack system, extending from Korjica (918 ft.) on one side to Pazaric (1,968 ft.) on the other. The gradient on the southern slope, 6.7 miles long, is 1 in 16.67. There is a succession of short tunnels, the summit tunnel, on the crest of the watershed between the Adriatic and the Black Sea, being 2,126 ft. in length. The same gradient is obtained on the northern slope to Rasteljica, and after a further steep incline at Tarcin there is a continual fall to Sarajevo.

The line is laid on the Abt rack system, the central rack being secured to steel cross-sleepers. On the 180-ft. span bridge over the Luka, on a gradient of 1 in 33⅓, it was necessary to provide longitudinal slots in the saddles for the rack to be independent in construction of the superstructure of the bridge, as it was not possible to provide for equal expansion and contraction in both.

Sarajevo is now the chief station on the line, and is the seat of the management, possessing also workshops, locomotive and carriage sheds, and warehouses. On most of the line from Mostar good stone was readily available, but between Konjica and Rasteljica the material had to be brought over several miles of rough tracks, which added greatly to the cost of the work. The soil was mostly a heavy loam. The skilled masons were chiefly Italians, ordinary masons Croatians and Dalmatians, while the general laborers were from the surrounding districts. The quantities of excavation were:

	Earthwork. Cubic yards.	Rock. Cubic yards.
Mostar to Konjica	579,200	437,600
Konjica to Sarajevo	1,084,700	386,100

MASONRY.

	In bridges. Cubic yards.	In walls and other works. Cubic yards.
Mostar to Ostrozac	92,300	364,000
Ostrozac to Sarajevo	129,350	162,500

The length from Mostar to Sarajevo is 83¼ miles. The cost of the line, 34¾ miles, from Mostar to Rama, was £233,300, equivalent to an average (including rolling stock) of £6,700 per mile; from Rama to Sarajevo, 48½ miles, £458,300, or about £9,500 per mile inclusive.

On the 1 in 300 gradients from Metkovic to Mostar the 100-H. P. engine, weighing when full 16.8 tons, hauls trains of 180 tons. From Mostar to Konjica, 200 H. P. engines are used, weighing 24.6 tons, with three coupled axles, the maximum gradient being 1 in 100. The Abt combination engines working between Konjica and Sarajevo have three coupled axles and radial trailing axle, and are of 250 H. P., working at 172 lbs. pressure. The cylinder for the ordinary (adhesion) driving-wheels is 13⅜ in. diameter and 17¾-in. stroke, the diameter of the driving-wheels being 2 ft. 7½ in. The cylinder for rack-driver (diameter of wheel 2 ft. 2⅝ in.) is 11¾ in. diameter and 14¼ in. stroke. The total working weight is 30.8 tons, the maximum per axle being 8 tons. Each engine is guaranteed to take (exclusive of its own weight) a train of 110 tons up an incline of 1 in 28.6 at a speed of 5.6 miles per hour, its actual performance being further equal to a load of 60 tons up an incline of 1 in 16.67 at from 5 to 5½ miles per hour.

*By F. Pfeuffer. From "Extracts of Papers," Institution of Civil Engineers.

Notes on British Train Speeds.*

IV.

THE LONDON & NORTH WESTERN.

Generalities on Train Service.—The London & North Western is the most important railway in England, and possesses most of the quickest routes from London to the large towns of England and Scotland. Its main line has few towns of any importance on it, most of them being reached by short branches from the trunk of the system. For instance, Liverpool and Manchester are on separate branches diverging from Crewe, and Birmingham and the large towns in its neighborhood are reached by a branch leaving the main route at Rugby. Besides possessing a good share of the Scotch traffic, the London & North Western secures nearly all the Irish traffic from London by means of its short route via Crewe, Chester and Holyhead.

The London & North Western train services are, as a rule, very good. Further particulars concerning them are set forth in the table below:

Services to and from London.

Between London and	Distance.	No. of trains at or over 40 miles an hour.		Fastest.
	Miles.	Down.	Up.	h. m.
Birmingham	113	3	7	2 20
Wolverhampton	125⅝	3	1	3 0
Northampton	65¾	7	9	1 24
Rugby	82¾	28	26	1 43
Crewe	158	17	15	3 12
Chester	179¼	10	8	4 3
Holyhead	263¾	2	2	6 5
Liverpool	193½	6	6	4 20
Manchester	188¾	7	8	4 15
Preston	209	9	8	4 20
Carlisle	299¼	7	6	6 22

The excellent services detailed in the table above necessitate, of course, some fast running between the intermediate stopping stations on the line of route. Between London and Rugby instances of 50 miles an hour and upward are tolerably frequent. One of the best booked runs on this section is that of the up afternoon Scotch express, which is allowed 105 minutes for the 91¼ miles between Nuneaton and London (Willesden Junction). There are several others similar for shorter distances. From Rugby northward toward Preston the general speed is not so high and there are fewer express runs. Still, there are several examples here; such are the run of the down day Scotch express from Rugby to Crewe 75¼ miles in 85 minutes, and the run from Crewe to Preston (51 miles) in one hour by some of the best Scotch trains. North of Preston the running is extraordinarily fast, there being several trains at about 50 miles an hour booked speed over this very hilly section. One of them

Stations.	Miles	Rugby to Crewe in 83 min. 43 sec. (75¼ miles.) Engine "Teutonic" and 19 coaches (228 tons). Time due.	Time actual.	Speed in miles per hour.	Particulars of gradients.
		s. m.	h. m. s.		
Rugby dep.	....	11 49	11 48 52		
Brinklow	5¼	.....	11 57 0	39.	Gentle ascent.
Shilton	8½	.....	12 0 45	52.	Gentle ascent.
Bulkington	10¾	.....	12 3 22	53.	Gentle ascent.
Nuneaton	14¼	.....	12 7 0	58.	Falls at 1 in 330 and 360.
Atherstone	19½	.....	12 12 15	60.	Gentle d'sc'nt and ascent.
Polesworth	23¾	.....	12 16 26	61.	Falls at 1 in 400.
Tamworth	27¼	.....	12 19 53	61.	Falls at 1 in 400
Lichfield	33¾	.....	12 26 22	59.	Falls at 1 in 400 and rises at 1 in 330.
Armitage	38¼	.....	12 32 7	48.	Rises 2 miles at 1 in 330 and then alm'st level.
Rugeley	41¼	.....	12 35 13	58.	
Colwich	44¼	.....	12 38 33	54.	Almost level.
Milford	46½	.....	12 41 5	53.	
Stafford	50¾	.....	12 45 48	54.	
Great Bridgeford	54	.....	12 49 50	48.	
Norton Bridge	56¼	.....	12 52 11	57.	Rises at 1 in 400 to 1 in 600.
Standon Bridge	60¾	.....	12 57 20	52.	
Whitmore	64¾	.....	1 2 10	50.	
Madeley	67¼	.....	1 5 4	52.	Descends into Crewe (3 miles at 1 in 330; 4 at 1 in 177; and the rest at 1 in 250).
Betley	70½	.....	1 8 8	61.	
Crewe arr.	75¼	1 14	1 12 40	63.	

is only allowed 102 minutes to cover the distance of 90 miles. This equals nearly 53 miles an hour over a road that rises from sea level to about 900 feet above sea

*For previous articles see *Railroad Gazette*, Aug. 12, and 19, and Sept. 2.

Stations.	Miles.	Crewe to Preston in 56 min., 32 sec. (51 miles.) Engine "Celtic" (7 ft. Compound) and 19 coaches (228 tons). Time Due.	Time actual.	Speed in miles per hour.	Particulars of gradients.
		p. m.	h. m. s.		
Crewe.....dep.	....	.....	1 19 3		
Minshull Vernon...	4¾	.....	1 26 15	40	Level.
Winsford.....	7½	.....	1 28 57	61	Gradual descent, being rarely steeper than 1 in 600.
Hartford.....	11¾	.....	1 33 14	60	
Acton Bridge.....	14½	.....	1 35 59	60	
Preston Brook.....	18½	.....	1 40 9	58	
Moore.....	21¾	.....	1 42 41	65	
Warrington.....	24	.....	1 45 21	62	
Wigan.....	36	.....	1 58 3	57	Chiefly gradual descent and ascent about 1 in 400.
Standish.....	39¾	.....	2 2 30	44	Rise at 1 in 120 and 1 in 200.
Coppull.....	43¾	.....	2 6 6	42	do. do.
Leyland.....	47	.....	2 11 18	61	Descends into Preston on grades varying from 1 in 110 to 1 in 330.
Farrington.....	49¾	.....	2 12 53	66	
Preston.....arr.	51	.....	2 15 35	59	

Stations.	Miles.	Preston to Carlisle in 103 min. 52 sec. (90 miles.) Engine "Teutonic" and 15 coaches (180 tons). Time due.	Time actual.	Speed in miles per hour.	Particulars of gradients.
		p. m. 2:40	h. m. s.		
Preston.....dep.	....		2 43 14		
Barton.....	4¾	.....	2 50 38	39.	Rises at 1 in 500.
Brock.....	7½	.....	2 53 27	59.	Gradual descent.
Garstang.....	9¼	.....	2 55 30	59.	Level.
Scorton.....	12¾	.....	2 58 59	58.	Level.
Bay Horse.....	15¾	.....	3 1 35	56.	Level.
Galgate.....	16¾	.....	3 3 3	61.	Level.
Lancaster.....	21	.....	3 7 31	56.	Ascends at 1 in 660, and then falls at 1 in 95.
Hest Bank.....	24	.....	3 10 27	62.	Easy descent.
Bolton-le-Sands.....	25½	.....	3 11 44	70.	Level.
Carnforth.....	27¼	.....	3 3 39	55.	Rises at 1 in 471.
Burton & Holme...	31¾	.....	3 18 53	52.	Rises 2¼ miles at 1 in 131 and then falls at 1 in 280.
Milnthorpe.....	34½	.....	3 21 54	55.	Level.
Oxenholme.....	40	.....	3 29 21	44.	Rises at an average of 1 in 175, with short piece of 1 in 109.
Grayrigg.....	47¼	.....	3 41 18	36.	Rises at 1 in 105, 1 in 120 and 1 in 133.
Low Gill.....	49	.....	3 43 41	44.	Descends at 1 in 200.
Febay.....	53	.....	3 48 16	52.	Undulating.
Shap Summit.....	58½	.....	3 58 13	33.	Rises 1 mile at 1 in 147 and 4½ miles at 1 in 75.
Shap.....	60¾	.....	4 1 22	43.	Descends at 1 in 125.
Clifton.....	68.	.....	4 7 35	70.	Descends at 1 in 125.
Penrith.....	72¼	.....	4 11 1	74.	Descends at 1 in 125 and 182.
Plumpton.....	77	.....	4 15 27	64.	Partly level and partly descending at 1 in 134.
Calthwaite.....	79½	.....	4 17 38	69.	Partly level and partly descending at 1 in 169.
Southwaite.....	82¾	.....	4 20 36	66.	Descends at 1 in 169 and 1 in 229.
Wreay.....	85¼	.....	4 22 45	70.	Descends at 1 in 239 and 1 in 190.
Carlisle.....arr.	90	4:25	4 27 0	66.	Descends at 1 in 140 and 1 in 132.

Such speed on such heavy gradients is probably unequaled anywhere else in the world. An extremely fine example of run over this section is given below in some detail, together with particulars of the gradients to be surmounted.

Elsewhere on the North Western Company's system the speed presents nothing remarkable. Some good work is done on the Chester & Holyhead section, and an excellent service of trains runs between Liverpool and Manchester every hour in 45 minutes (31⅛ miles). Punctuality is exellent throughout the whole system, and the very fastest trains are generally the most punctual.

Locomotives and Train Loads. — Few English Locomotive Superintendents are so well known as Mr. Webb the Mechanical Engineer of the London & North Western and originator of the three-cylinder compound system. Most of his locomotives do excellent work. Their principal dimensions, together with those of some earlier locomotives, built by Mr. Ramsbottom, and still at work on the fast trains, are given above.

Names of class.	Diameter of driving wheel.	Cylinders.	Heating surface sq. ft. Tubes.	Heating surface sq. ft. Box.	Grate area.	Weight in working order.	Weight available for adhesion.
	ft. ins.	inches.			sq. ft.	tons. cwt.	tons. cwt.
Six coupled coal	4 3	17 × 24	980	94.6	17.1	29 11	29 11
Six coupled D. X. class	5 0	17 × 24	980	94.6	17.1	31 5	31 5
Six coupled goods	5 0	18 × 24	980	103.5	17.1	34 0	34 0
Lady of Lake, singles	7 6	16 × 24	981	87.3	15.	27 5	11 10
Precursor type	5 6	17 × 24	980	94.9	17.1	33 8	21 4
Precedent type	6 6	17 × 24	980	103.	17.1	32 10	22 10
Six feet compounds	6 0	Low pressure 30 × 24 High " 13 × 24	1,242.42	159.1	20.5	42 10	30 0
Six and one-half feet compounds	6 6	Low " 26 × 24 High " 13 × 24	980	103.5	17.1	37 15	27 7
Seven feet compounds	7 0	Low " 30 × 24 High " 14 × 24	1,242.42	159.1	20.5	45 0	31 0
New Engine "Greater Britain" (No. 3,295)	7 0	Low " 30 × 24 High " 15 × 24	Forward 853 Rear 493 Chamber 39	120.6	20.5	52 2	31 0

Train Loads. — Train loads on the system are generally very heavy, frequently reaching, and often exceeding, 200 to 225 tons, exclusive of engine and tender. The fastest trains are often the heaviest, and it is not usual to employ assistant engines except on the very steep road between Preston and Carlisle.

Actual Performances (with particulars of gradients). —We present in the tables a few excellent examples of runs taken from daily practice on the North Western system. It will be seen that the gradients on the southern section of the system are very easy. Considering, however, the speed and weight of train hauled, the instances given will doubtless be deemed highly satisfactory examples of locomotive performances.

The New York & New Jersey Bridge — Route, Union Station & Terminals.

(WITH AN INSET.)

EXTRACTS FROM A REPORT TO THE COMMISSIONERS BY MR. T. C. CLARKE, CHIEF ENGINEER.

Preliminary Statement.—The states of New York and New Jersey have granted to the New York & New Jersey Bridge Company full power to construct the bridge, approaches and stations, and also to make connections with all railroads on the west side of the Hudson River (opposite the city of New York), in the state of New Jersey, and with the railroads coming to the city from the north and east. . . . The Commissioners located the proposed bridge, its connections, and re-located the Union Depot at Forty-second street, Seventh avenue and Broadway. All the surveys and borings in the river necessary to determine the practicability of the location have been made. The location of the land pier of the bridge is on the block between Seventieth and Seventy-first streets, Eleventh and Twelfth avenues, in New York City, then extending in a direct line with that block across the river to the state of New Jersey, and is believed to be the best location for the public convenience. On the New Jersey side connections are to be made with all railroads that come to the west side of the river. On the New York side the approaches extend southerly from Seventieth street (between Eleventh and Twelfth avenues,) to Forty-fifth street, thence curve to the east to the Union Depot at Forty-second street, Seventh avenue and Broadway. The approach for the Eastern traffic runs along the Hudson River to a level, and outside of the Hudson River Railroad tracks, to about One Hundred and Fifty-third street; then running above the tracks of that road, turning to the east so as to reach and make connections with all the railroads from the North and East — thus making unbroken wheel traffic into and through the city of New York to all sections of the country both possible and practicable. The officials of the company are losing no time in preparing the detail plans necessary for the commencement of the great work.

Union Station, Connecting and Terminal Tracks.—The bridge will be connected with the station at Broadway and Forty-second street by a steel viaduct, whose tracks will be laid upon steel floors, covered with broken stone, so that trains can run with same speed and absence of noise as on an embankment. Guard timbers like those in use on the elevated roads will prevent derailment of trains. The average height is 60 feet, and the total length about 10,680 feet. The main grade from bridge to station is 0.85 ft. per 100 or 45 ft. per mile.

This new bridge and tunnel scheme is not intended to supersede the existing methods of transferring passengers across the Hudson River, but to increase present facilities by opening a new line, by which passengers coming from all parts of the United States can be set down in the centre of New York without change of cars or delays inseparable from crossing by ferries. Still less is it intended to interfere with the present system of handling freight by cars or floats, which reach all parts of the water front of Manhattan Island and Brooklyn. It is proposed to carry only through freight destined for the New England States, and such perishable articles and express freight as are used for immediate consumption.

It is proposed to take two city blocks, each 200 × 800 ft., and bounded by Forty-second, Forty-third and Forty-fourth streets, by Seventh avenue and Broadway and Eighth avenue, giving an area of nearly four acres. On this will be erected two buildings, each 200 × 800 ft., connected by a foot-bridge over Forty-third street. These will contain the usual waiting and other rooms and ticket offices, an arrival platform and a departure platform, each of twenty tracks; a terminal hotel; a general receiving and distributing post-office for the city, and a house for express and perishable freight—also eighteen stores with their cellars; and about 180 business offices for the railway, and for rental. The rentals of these various parts will be sufficient to reduce the rental for purely railway purposes to a small annual sum.

The accompanying plans will show how it is proposed to carry out this scheme. The trainshed will be divided into four stories, and the terminal hotel and offices into eleven stories. The upper or arrival platforms, which occupy both buildings, are 36 ft. above the level of Broadway, and incoming passengers can descend both by stairways and elevators. The departure platforms below the arrival ones will be but nine ft. above Broadway, and passengers will ascend by stairways to the general waiting rooms and ticket offices, which are in the northern building. From thence they will walk on a level, through the waiting lobby to the trains. In the southern building, at the same level, will be a large restaurant, also the dining and reception room and offices of the hotel.

Passengers after passing through the gates reach two lobbies each 40 × 200, connected by a bridge, where they wait until their train is called. Below these lobbies is the passenger baggage room, 28 × 196 ft., to and from which baggage will be taken to and from the trains by elevators. Directly along side of the baggage room are two driveways, each 54 × 200 ft., one for baggage the other for cabs, to which passengers come and go from the trains always under cover.

In the northern building below the departure platform a space 194 × 610 ft., with storage cellars below of the same size, has been reserved for a general distributing post-office. Mails will be transferred from the trains by elevators, and teams can drive in from the street.

The basement of the southern building on Forty-second street is intended to contain the express and perishable freight platform. Below it are cellars into which four tracks communicating with the bridge will be run. Freight will be transferred from the cars to the floors above by elevators, and teams can drive in from Eighth avenue and deliver or take freight. The size is 196 × 610. The storage cellars under the northern building can be used for cold storage.

The space, 96 × 196, between the above described rooms and Broadway, which will be about four feet below street level, can be used in the northern building for shops and stores, of which there is room for eighteen. In the southern building the same space can be used for the kitchen, offices, cafés, etc., of the hotel. Storage cellars of the same size will be placed below. Above the general waiting room there will be nine stories devoted to offices for use of the company or for rental. Above the hotel offices there will be parlors, etc., and eight stories containing from 250 to 300 bedrooms. It is intended that those buildings shall contain under one roof all the requirements of passengers coming from and going to all parts of the country. They will be fireproof throughout, finished in hard wood, and the public room will have marble bases and mosaic floors. The arrival trainshed will be covered by an arched steel roof, about 80 ft. above the level of rails. The terminal building will be of stone, the trainshed of brick with terra-cotta dressing. The departure train room will be 26 ft. high. As locomotives will stand at the outer end, no nuisance from smoke can take place.

These buildings were designed by Messrs. Creighton Withers and Ernest R. Tilton, artchitects, of New York, according to a general plan of arrangement given by me, and do much credit to their skill and taste.

From the five great passenger stations in New Jersey, there arrive and depart over 1,000 trains daily. During the busiest hour of each day, 5 to 6 p. m., there arrive 20 to 30 trains, and depart 50 to 60 trains. In the morning hour from 8 to 9 this order is reversed. If we have 20 arrival and 20 departure tracks we can handle 60 trains an hour. This allows 20 minutes on every track for a train.

Each departure and arrival platform will contain 20 tracks or 40 in all. Trains on arriving either from New England or the West will discharge passengers, mails and baggage, and then back out of the station and go westward to a point on the Viaduct between Tenth and Eleventh avenues. If they are suburban trains and wanted for immediate return, they will go back without delay to the lower departure platform. In other cases they can either stand upon the Viaduct, where there is provided a mile of sidings, or if not required for a longer time, they can recross the river to the storage yard on the top of the Palisades, about 2½ miles from the station. Here is provided a space of about 100 acres, on which passenger and freight cars can be held and started by gravity if required, thus dispensing with much use of locomotives. The N. Y. C. & H. R. Railroad takes many of its trains to a yard four miles from the Forty-second street station. By the use of this system

the tracks in the station are never used for storage of trains longer than the time necessary to discharge and take on passengers and baggage.

The number of tracks, as has been stated, will be limited by the number which can pass certain crossing points, of which there are one for incoming and one for outgoing trains. At one and a half minute's headway 40 trains per hour can come in above and 20 go out below, or 60 in all, equal to three trains per hour for each track. The total daily capacity would be 190 express and 600 local trains, or 790 in all. The amount of express business that can be done is limited by the amount of station platform room that can be given. The space provided, we have stated, is 194 × 610 sq. ft. After deducting four tracks or driveways, there remains 94,000 sq. ft. Express freight, and that for immediate consumption, requires but a short time for storage, so that 300 sq. ft. of floor space per car per day is enough.

The tracks are so arranged that each house contains 10 arrival tracks; upon each of these there will arrive 20 trains, or 40 per hour in all. Each house has its own track connecting all the others with the main track. The 20 trains which enter each house go out again as soon as unloaded, to give place to others. Thus there will be 40 crossings of the same point in 60 minutes, giving 1½ minutes headway for each. This is taken as the ultimate hourly capacity. While the 40 trains are arriving above, and are disposed of outside the house, 20 trains are dispatched from below, making 60 trains per hour in all, and shown in the two busiest hours of the following time table, which gives the ultimate daily capacity:

MAXIMUM NUMBER OF DAILY PASSENGER TRAINS IN BOTH DIRECTIONS.

No. of hours.	Trains per hour out.	Trains per hour in.	Total.
1	40	20	60
1	20	40	60
3	30	15	135
3	15	30	135
4	20	10	120
4	10	20	120
8	10	10	160
24	..	..	790

It is intended that all trains for New York shall be taken as far as the storage yard by the locomotives of their own roads, at which point each road can have its own engine house, or there may be a union house for all the roads. From here the trains will be taken by bridge engines, which will be double enders, to obviate the necessity of turn tables on the elevated structures. They will change from one end of a train to the other, as engines on the Manhattan elevated lines do. These engines will take all trains into the New York station and back to the yard. They will also handle all trains to and from the New England roads between the storage yard and Seventy-ninth Street, North River.

A second freight house, 94 × 799 ft., can be placed below the viaduct between Eighth and Ninth avenues, containing 59,000 sq. ft., exclusive of two driveways or tracks. This will give a total space of 153,000 sq. ft., which divided by 300 will accommodate 510 cars daily.

In order to avoid another high viaduct running from the bridge level northerly along the west side of Riverside Park, which would be an unsightly object, it is proposed to run through freight trains passing between the West and New England, from the bridge end along the viaduct to a point near Tenth avenue, where they will reverse and move in a northerly direction, descending to the river level under the main tracks by a grade of 30 ft. per mile.

We can now see what the total number of tracks and full capacity of the bridge should be:

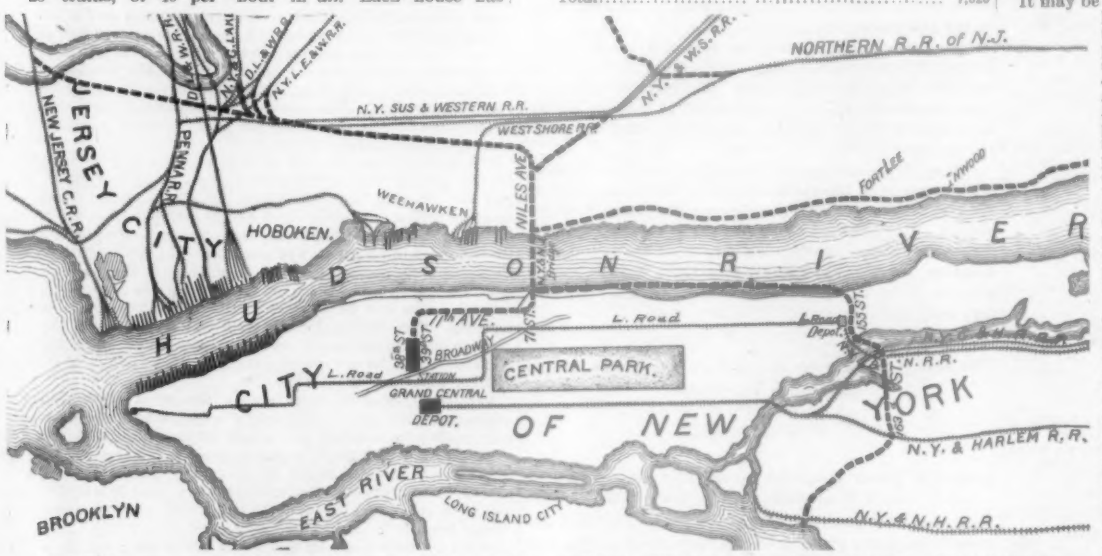
Local trains, New York	600	Crossing.
Express trains, New York	190	"
	790	Crossing.
Local freight trains: 500 × 2 times ÷ 10 cars per train	100	"
New England freight: 1,000 cars each way × 2 ÷ 20 cars per train	100	"
Total	990	Crossing.

Two hundred and forty-eight trains daily on each of four tracks, or about 10 trains per hour.

It is not necessary that freight trains should cross the bridge during the most crowded passenger train hours, so that four tracks can be used for 40 trains per hour one way and 20 another; 60 trains equal to 15 trains per hour on each track hour, or four minutes headway. This shows that four tracks on the bridge will be enough to do all the business that can be handled in the Union Station. To provide for future increase it is proposed to design the bridge for four tracks, making the foundations and piers strong enough to carry six tracks. The other two tracks can be added, when required, without delaying traffic, by the mode of construction devised by me.

The maximum number of cars that can cross the bridge daily in both directions on four tracks is as follows:

	Cars.
Local passenger trains, 600 trains of 5 cars each	3,000
Express passenger trains, 190 trains of 8 cars each	1,520
Local freight trains, 100 of 10 cars each	1,000
New England freight trains, 100 of 20 cars each	2,000
Total	7,520



LOCATION OF THE NEW YORK AND NEW JERSEY BRIDGE—APPROACHES AND RAILROAD CONNECTIONS.

The addition of two more tracks would add nearly 50 per cent., making the total capacity about 11,000 cars daily in both directions.

NEW YORK, Aug. 31, 1892.

Steam Car Heating.*

An impetus was given to efforts in the direction of steam heating some years since by the public interest in the subject, which was aroused by the number of railroad accidents in which fire from the heaters in the car was communicated to the wrecks and resulted in great loss of life and property. It became then a question not of economy, but of public safety. The question of economy has now to be considered as well as safety and comfort, and the relative consumption of fuel is the basis upon which economy is commonly determined. Very little data is at hand to show how much hard coal stoves or individual heaters require, but from tests made on the C. B. & Q. 200 lbs. of anthracite coal was about the average per car per day found for Searle, Baker and Westinghouse heaters. The C. B. & Q. assumed 50 lbs. condensation per car per hour, and the evaporative power of their coal burned upon the locomotive as low as 5 lbs. of water per pound of coal. With this data, and giving $6 per ton as the price of hard coal and $2 per ton for soft coal burned upon the engine, and figuring upon a basis of 150 cars for 150 days' service, they show a saving in the cost of fuel alone of $12,250 for one season.

The assumption of 50 pounds condensation per car per hour, as made by the C. B. & Q., was evidently too small. Consequently their saving was estimated too large. It has been proved by actual test that the average of condensation per car per hour is 65 lbs. of water at zero weather. Now, assuming that your soft coal on the engine costs you $2 a ton, this would involve the expenditure of 1 3-10 pounds of coal per car per hour, and in estimating the total cost we will assume a day of 24 hours, which would bring the cost of consumption on the engine to 31 2-10 cents per car per day. Assuming that your hard coal, as now used in the individual heaters, costs you $6 per ton, and taking the actual test upon the C. B. & Q. for a standard—and their average individual heaters consumed 200 pounds of anthracite coal per car per day—you then have an expenditure of 60 cents per day for the individual heater, or nearly 100 per cent. in excess of the actual cost of fuel used on the engine for heating purposes. This estimate is made on the assumption that all of the steam sent back from the locomotive for heating purposes would not otherwise be wasted; consequently it is evident that should the safety valve of the engine be blowing, no consumption of fuel for train heating should be estimated during that time. . . . Another method of communicating the heat of steam to the water of circulation was to inject the steam directly into the body of water to be circulated. This method has proved more efficient, owing to the fact that the heat units of the steam are introduced into the water of circulation itself, and to the fact that the circulation is aided by the action of the steam causing a motion of the water, on the principle of the injector. A more rapid circulation through the pipes is thus obtained than by any other known method. The transmission of heat through the pipes is more even, due to the fact that the rapid circulation allows but a short time for the water to cool before returning to the heater, as is plainly shown by the fact that circulation is obtained in from 10 to 12 minutes in an ordinary car, and the loss of heat is simply the amount of radiation which takes place during this length of time. Introducing the steam directly into the water circulation necessitates an overflow, by which the pipes are relieved of the accumulated condensation, and this overflow absolutely prevents the phenomenon known as "air bound," permitting at all times a ready and free circulation, as the air space in the expansion drum is in communication with the outer atmosphere, thus relieving the circulating pipes from any objectionable internal pressure. . . .

The greatest obstacle to the use of direct steam heat has been found in the difficulty in regulating the temperature of cars. . . . Improvements, however, have been made on this method of live steam heating by which the water of condensation is allowed to accumulate in the lower course of pipes, so that a partial effect of hot water heating has been obtained. This method became practicable by the adoption of methods of heating the water in the lower course of pipes by connecting the lower course to castings placed within the train pipe itself, and so arranged that the water of accumulation passed through a port in this casting before escape. The connection of this pipe to this casting, which receives heat from the train pipe itself, prevents the possibility of freezing the drip pipes beneath the car, and at the same time communicates heat to the water stored within the pipes.

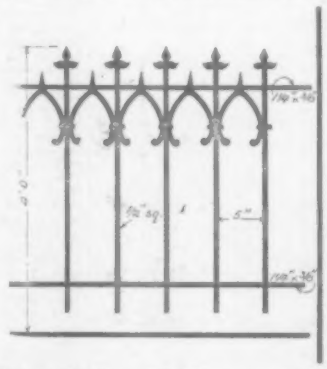
It may be interesting in conection with the subject of heating by live steam to note the temperatures which are obtained in the radiating pipes corresponding to different steam pressures within these pipes. For example, we cannot have steam at all within these pipes at a temperature less than 212 deg. Fahr. At 5 lbs. steam pressure the temperature of the pipe is 227 degs. Fahr. At 10 lbs. pressure, the temperature rises to 239 degs., at 15 lbs. pressure to 250 degs.; and continues, in decreasing ratio, to increase in temperature with the increase of steam pressure used. It is to be noted that the increase in temperature of the radiating pipe is very small compared with the increase of pressure used, so that the possibilities of regulation of temperature by varying the steam pressure within the pipes is extremely limited.

The amount of condensation which discharges beneath the car is proportional to the amount of radiation from the heating pipes, considering, of course, the different temperatures at which this condensation leaves the car. The condensation, when its temperature and weight are considered, affords a means of determining the exact amount of heat employed in each car. However, when we know the weight of this condensation per car per hour we have means then of determining the cost of heating cars by means of steam from the locomotive. If we consider that in a locomotive boiler one pound of coal will evaporate seven pounds of water, we have at hand the means of determining the amount of coal burned in the locomotive boiler to evaporate the water which has been used to heat the car. The amount of condensation taking place beneath the cars, as said before, depends somewhat on the temperature at which the condensation leaves the car, and as different heating systems discharge water at different temperatures, they are found to vary somewhat in the quantity of steam used and consequently in the cost of heating. Actual measurements show that in freezing weather about 60 lbs. of condensation per hour takes place in order to maintain a temperature of 70 deg. within a car. If the locomotive boiler evaporates 7 lbs., of water for 1 lb. of coal, each car would require 8.57 lbs. of coal per hour to heat under the above conditions. The cost of heating a car would therefore depend upon the cost of coal. Knowing the cost of coal in any given case, it is easy to determine the cost per car per hour.

*Extracts from a paper read before the Northwest Railroad Club, Sept. 14, by J. C. Halladay, Esq.

Iron Fence Between Tracks at Trenton.

The accompanying cut gives a fair idea of a section of a very neat and handsome wrought iron fence which has been put up by the Pennsylvania road between the main tracks at the new station at Trenton, N. J. The cut needs no explanation. Everyone is doubtless in favor of a fence of this kind, provided it is cheap enough, and the cost is therefore the principal point of interest. This is, at Trenton, $1.05 per lineal foot, set in place. The fence was made by A. L. Smith & Co., of Philadelphia. Each panel is made so that it can be readily detached from the posts and lifted out of place to afford room to pack a hot box or repair the running gear of a train standing at the station.



Compound Swivel Head for Universal Cutter and Reamer Grinder.

We illustrate herewith the improved compound swivel head as now applied to the well known universal cutter and reamer grinder of the Brown & Sharpe Mfg. Co. This swivel head is useful for recutting and sharpening end and hollow mills and for sharpening fine tooth mills, angular and side milling cutters, as well as for some of the special grinding operations for which the plain machine is used. It has three swivel adjustments, so that work can be moved in different directions past the wheel. Referring to the illustration: by means of the clamp *c*, the head is held upon the main guide bar *A*,

which forms one of the swivels. The swivel head *G* is carried by the slide *s*, which is held to the clamp *c* by means of the swivel *f*. The tooth rest is seen at *z*. The slide is moved by the handle *h*, and the notched connecting rod *n* allows the handle *h* to be placed in any convenient position.

Fig. 1 shows the head readjusted to recut a left-hand end mill. The wheel cuts in the space between *z* and *f*, fig. 1, as the slide is moved by the handle *h*. The slide is shown in position for changing the mill to recut the next tooth. Fig. 2 shows the compound swivel head adjusted to grind a right-hand angular mill, and fig. 3 shows the head in position to grind a left hand angular mill.

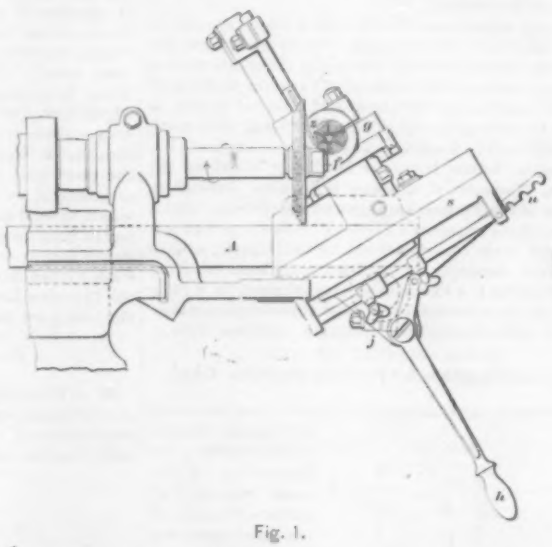


Fig. 1.

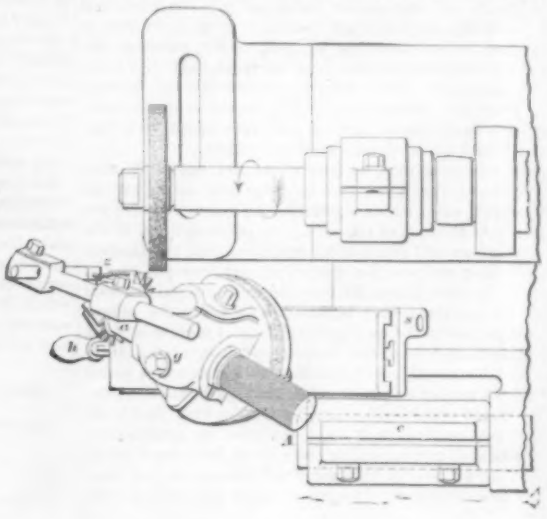


Fig. 2.

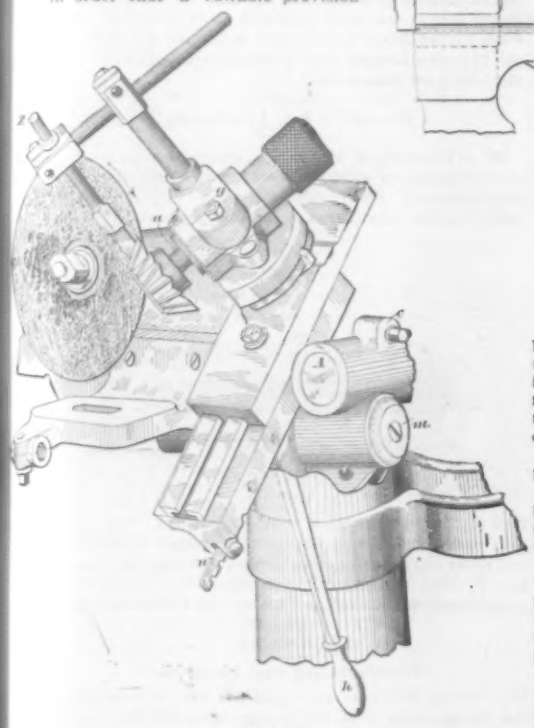


Fig. 3.

Compound Swivel Head for Cutter and Reamer Grinder.

By the BROWN & SHARPE MFG. CO., *Providence, R. I.*

Provident Funds on Indian Railroads.

About 25 years ago the Directors of the East Indian Railway foresaw the benefits which might be derived from the introduction of a system which would give railway employés a direct interest in the economical and efficient working of the line on which they were engaged; and the East Indian Railway Provident Fund was accordingly formed, and has been in existence ever since with good results. In 1889 the Indian Government decided that all future appointments to the State railway service were to be *non*-pensionable, "except in cases when men who were *entitled* to pensions under their agreements were transferred from other branches of the service, such as Royal and Cooper Hill engineers, accountants, etc., and provident funds were formed on all State railroads, in order that a suitable provision might be made for those who were no longer to be entitled to pensions or retiring allowances.

In many respects a provident fund is superior to a pension scheme, and makes better provision for the wives and families than a pension does. A large proportion of pensionable officials in India either die before they are eligible for a pension or within a few years after they retire from the service; and, unless some provision has been made for their families by insurance or by subscribing to a family pension fund, they are left unprovided for, as in the majority of cases the cost of living, coupled with the heavy expense of educating their children, and the loss by exchange, effectually prevents the majority of men from saving any portion of their salaries.

On the other hand, an old depositor in a provident fund receives when leaving the service a lump sum which, if invested in government securities, will bring in an income nearly if not quite as large as the pension to which, under the old rules, he would have been entitled; and, when he dies, the capital is still untouched, and can either be invested for the benefit of his family or divided among them. The pension dies with the man. Another argument in favor of the Provident Fund is, that a pensionable employé who leaves the service of his own accord after serving fifteen or twenty years forfeits all claim to pension; while, as a member of the provident fund, he would have received something even after ten years' service.

Most of the guaranteed and assisted railroads have followed the lead of the East Indian, and, although each line has rules of its own, they do not differ materially from the government rules which we print below:

RULE I. Preamble only.

II. A Government savings bank, of which the manager shall be secretary, shall be opened in the office of every manager of a railway.

III. Each manager shall deduct and withhold the following sums from the salary of every servant employed under him, and deposit them in the savings bank on behalf of the said servant, namely:

(*a*) From each rupee of the salary of every married servant, or widower with children dependent on him not being of purely Asiatic descent, and of every other servant who may in writing so desire, the manager shall deduct one anna.

(*b*) From each rupee of the salary of every other servant the manager shall deduct half an anna.*

IV. After the expiring of each half year, the deposit account of each servant of the non-pensionable superior staff, and of each servant of the subordinate staff, whether pensionable or non-pensionable, shall be provisionally credited with a bonus equal to one half of the compulsory deposits made on his behalf during the half year.

V. As soon as the revenue account of a State railway for a half year is made up, one-half per centum of the ascertained *net* earnings during the half year shall, subject to the proviso in Rule VI., at the discretion of the government and until further orders, be provisionally distributed as a bonus among the depositors of the railway in proportion to the compulsory deposits made on their behalf during the said half year.

VI. The aggregate bonus granted for any half year to a depositor shall in no case exceed the compulsory deposits made

VII.—If the bonus calculated under Rules IV. and V. appears to the government in any case insufficient, the Government of India will deal with the case specially according to its discretion, but subject always to the limit in Rule VI.

VIII.—Any bonus accruing to a depositor under Rule IV. or V. shall be added provisionally to his deposits with effect from the date on which the revenue accounts of the railway on which he was serving during the period for which the contribution is made have been finally passed, and sent forward for transmission to the Government of India. Any bonus accruing under rule VII. shall be added provisionally as soon as practicable after intimation of the amount has been received by the secretary of the institution. All bonuses and all interests provisionally accruing thereon shall be shown in a separate column in his accounts, and shall be subject to the condition prescribed in Rule XIV.

IX. A servant or any employé on a state railway may, at his discretion, make voluntary deposits in the Provident Institution in addition to the compulsory deposits (if any) made on his behalf. Such voluntary deposits and the interest accruing thereon shall be entered in a separate column in the depositor's account, and held at his free disposal under the ordinary government savings bank rules. Deposits shall be subject to all the rules as to interest and to all other conditions affecting ordinary deposits in government savings banks, excepting that the voluntary deposits under clause I. of this rule only are to be reckoned in applying the maximum limits as regards amount of deposit and interest allowable.

X. Saving with the particular sanction of the Government of India, no compulsory deposit or bonus shall be withdrawn, excepting:

(i.) On the decease of the depositor.

(ii.) On his leaving the public service.

(iii.) With the permission of the manager under Rule XI.

(iv.) On ceasing to be a servant by transfer to other government service when the balance at credit of depositor is less than 10 rupees.

XI. On the Manager being satisfied that the pecuniary circumstances of a depositor are such that the indulgence is absolutely necessary, the compulsory deposits of the depositor, and if they do not suffice, his bonuses, or any part of his bonuses, may be withdrawn temporarily.

(i.) To pay for the passage of the depositor proceeding to Europe on medical certificate, or returning after such absence;

(ii.) To pay for the passage of any member of the depositor's family coming from Europe to join him, or proceeding to Europe sick or from other urgent cause.

XII.—In addition to the compulsory deductions under Rule III., the manager shall withhold monthly from the salary of such depositors, and deposit again in the savings bank, one twentieth part of any sum withdrawn under Rule XI. Such deductions shall be made whenever full salary is drawn until the whole is refunded, the withdrawls from the bonus account, if any, being first made good.

XIII.—When a deposit account is first opened, the depositors shall be required to give the manager a certificate under his signature, and in his own handwriting, giving the name or names and addresses of any person or persons whom he believes to be his next-of-kin, or to whom he has bequeathed the whole or any portion, or portions of his deposit. Each depositor should be invited to revise the certificate at least once a year. All such certificates still in force should be carefully recorded in the manager's office.

XIV. If a depositor is dismissed from the public service, the manager may, with the sanction of the Local Government concerned, or the Director-General of Railways, withhold all or any part of the bonus provisionally allotted to him with the interest accrued thereon, and pay to the depositor only the balance at his credit without such bonuses and the interest thereon.

In the case of there being any outstandings against a depositor who may have absconded, resigned or been dismissed the manager may deduct the amount of such outstandings from his compulsory or voluntary deposits and pay to him the balance only after such deductions.

XV. Any bonus and interest withheld from a dismissed depositor under Rule XIV. shall be credited to the fine fund of the railway.

XVI. All bonuses granted to depositors under these rules shall be debited as a separate item to the revenue of the railway under abstract G, "Special and Miscellaneous Expenditure." Sub-head VI. "Contribution to State Railway Provident Institution."

XVI. These rules do not necessarily apply to railways the property of the native states, but they are recommended for adoption on such railways.

Compulsory deposits can only be made by deductions from such salaries as are disbursed by the railroad authorities. Employés absent from the line can continue to make voluntary deposits, provided that they make their own arrangements for payment of the same.

The question having been raised whether the amount of money standing to the credit of a state railroad employé in a State Railway Provident Institution was liable to attachment in a court of law, the opinion of the Advocate General was obtained, in order to settle the matter once for all. He decided that voluntary deposits can be attached by judgment creditors. They are sums of money payable on demand, due by the government to the railroad servants who have deposited them. Compulsory deposits cannot be attached by judgment creditors. These deposits are not the property of railroad servants, nor are they the property over which they can be said to have a disposing power. It is equally clear that the bonuses cannot be attached by judgment creditors. These neither belong to the railroad servants, nor do they constitute property over which these servants have a disposing power which they can exercise for their benefit. Compulsory or voluntary deposits cannot be forfeited under any circumstances; but the manager can, when a claim is presented for the balance at credit, deduct any amount due to him on behalf of the fund before handing over the property of the claimant.

All deposits are considered as paid into the fund on the first of the month succeeding that for which the salaries from which deductions are made are due. The heirs or estate of a deceased servant is credited with a proportionate share of the bonus due to the amount of the compulsory deposits made on his behalf during the half-year in which he died, as soon as the accounts for the half-year are adjusted; and persons who are transferred to other branches of the public service are also allowed to participate in the bonus in proportion to the amount of their compulsory subscriptions for the half-year during which they are transferred. But, in the case of the resignation or dismissal of a servant, or of his transfer at his own request, or on account of unsatisfactory working, the said servant can only participate in such bonuses as have already been declared, and has no claim to any share of the bonus granted for the half-year during which he is transferred.

* This is equal to 6¼ and 3⅛ per cent, respectively on his behalf during the same period.

Employés whose monthly salary is less than 15 rupees, or who receive daily or weekly wages are not eligible as members. Rule VI. is strictly observed on all State railways, and although not compulsory on guaranteed railways, there is very little chance for depositors profiting by the exception in the majority of cases.

On the E. I. Railway the subscriptions are limited to 5 per cent. compulsory, and 6 per cent. optional, and for many years the fund has, in addition to paying cent per cent. on the total amount of compulsory subscriptions, paid bonuses varying from 30 to 60 per cent. on the amount received as voluntary contributions. In this way men who receive 200 rupees per month subscribe 240 rupees per year, and the railroad company doubles the compulsory portion, besides giving as large a percentage as the net earnings will admit of on the voluntary contributions, or, for example, 120 rupees on the former, and say 60 rupees on the latter, making a total at the end of the year of 420 rupees.

Some of the officials who have retired from the East Indian Railway during the last few years (under the 55 years' rule) have received from the Provident Fund sums varying from 100,000 rupees to 150,000 rupees, of which quite three-fifths had been contributed by the company, or represented profit on investments; and many of the working staff have now from 15,000 rupees to 20,000 rupees standing to their credit, although the monthly subscription has been so small that they have never missed it. Had the Provident Fund not existed the amounts paid as subscriptions would in all probability have been wasted; or, at any rate spent in a way that would not have produced any return.

This company does not guarantee any bonus or contribution until five per cent. has been paid on the capital expended, after which it contributes a sum equal to the aggregate amount of the members' subscriptions, if the net earnings will admit of it; providing that the amount does not exceed one per cent. of the net receipts for the year. The East Indian Railway has hitherto paid so well that its provident fund, in addition to being the oldest in India, is also the most profitable to its members. Last year (1891), thanks to the recommendation of the Managing Director (General Strachey, R. E.), an extra bonus of 100,000 rupees was paid to the fund, and this was ratably divided on the subscriptions for the first half year. All money received is at once invested in government securities, or guaranteed railway stock, and the fund is managed by five of the principal officers of the company free of charge. The clerical staff are paid by the Fund.

No portion of the Fund standing to the credit of a member can be withdrawn while he remains in the service; but loans are granted at a reasonable rate of interest to subordinates who are unable to pay the passages of their families from England to India in any other way. If an employé is dismissed (not discharged) he only receives the amount of his subscriptions with three per cent. simple interest thereon, and the Provident Fund is therefore a powerful factor in keeping men steady and careful; for they know that bad conduct not only renders them liable to dismissal, but also causes the forfeiture of more than half the amount standing to their credit in the books of the Fund.

From the rules that we have quoted it will be seen that on railroads where the traffic is light, or where, as on the Frontier Railroad, the outlay has been heavy, and the receipts are never likely to be so, the government rules are the most advantageous to the employés, insomuch that they are bound to receive a bonus of 50 per cent. on their compulsory subscriptions, even if the line is worked at a loss. On lines where the prospects of a big dividend are very remote, there is, of course, nothing to be gained by joining the voluntary section; and on all state roads the voluntary subscriptions are treated as savings bank deposits.

Native employés, especially the working class, do not, as a rule, appreciate the benefits conferred by a well managed Providential Fund. They do not approve of their money being tied up in such a manner that they cannot obtain the use of it without leaving the service, The managers of some of these funds having found that improvident men were in the habit of resigning, in order to get possession of the amount standing to their credit, and that after doing this, they applied again for employment, it has been decided that before any man can be re-engaged he must return to the Provident Fund the full amount which he withdrew from it when leaving the service.

The total amount standing at the credit of depositors in the several State Railway Provident Institutions on Dec. 31, 1890, was 3,975,778 rupees, of which 1,590,868 rupees belonged to employees on the Northwestern Railway. In addition to this the East Indian, Madras, Bombay, Baroda & Central India, and the Great Indian Peninsula railroads have funds of their own which are not included in the Government return.

Although the institution of provident funds, when the bonus depends *entirely* upon the *net* receipts, is calculated to make all classes practice the most rigid economy, they are prevented from going too far by the careful and continued supervision exercised by the Consulting Engineers to Government, or as they are now to be termed, "Government Inspectors." Every part of the open line is now inspected twice a year by the Government Inspectors, who are accompanied by the chief Engineer of the line and the district officers of all departments.

Religion on Railroads.

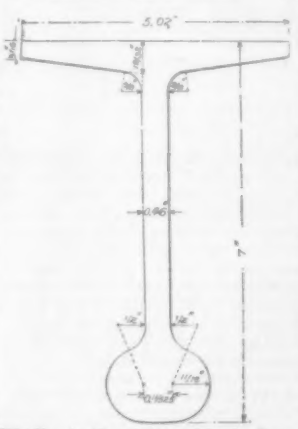
A considerable part of the Baltic provinces of Russia is peopled by Germans who are Lutherans, and next south is Russian Poland, where the people are Catholics and speak Polish, though Russian is taught in the schools. Some time ago it was reported that the government had ordered that in these provinces four-fifths of the railroad employés must be of Russian origin and belong to the orthodox Greek church, while the other fifth might be Catholics and Lutherans. This report was doubted at the time, but it now seems to be confirmed. A delegation of the principal officers of the Warsaw & Vienna Railroad is said to have gone to St. Petersburg to urge the Minister to modify the order, which would cause a general change of the working force to inexperienced men.

In the German province a newspaper reports that on July 6 all enginemen who were Catholics or Lutherans were discharged, and Russians who had passed an examination in the St. Petersburg technical school appointed in their places. A large number of other employés were also changed in the same way. The employés discharged had formerly been required to learn Russian as a condition of keeping their places, and having learned it they are discharged.

In Finland, which is north of the bay at whose eastern extremity stands St. Petersburg, and which is a country distinct from Russia, of which the Czar is the constitutional sovereign, much as the Emperor of Austria is King of Hungary, and has a government and railroad system of its own, the railroad employés are now being systematically instructed in Russian. The Finns are a Scandinavian people, whose language is closely allied to the Swedish. The method followed is to give Russian instruction to the Finnish employés on the Russian border until they have acquired a certain command of that language, and then transfer them to the interior, and so bring other employés to the border to learn Russian, which of course is a valuable accomplishment in a little country so surrounded by a vast Russian population, and with such constant and intimate relations with it.

Steel Needle-Beam for Pullman Standard Cars.

The Pullman Car Company has recently put into use a new shape of steel needle-beam, the dimensions of the cross section of which are shown by the accompanying cut. It will be seen that this is a form of steel which has heretofore been used largely for deck beams. This is its first use in car building and is one of the several interesting departures lately made in the introduction of steel shapes. It is 7 in. deep, with a 5-in. flange, weighs 23½ lbs. to the foot and is the Carnegie, Phipps & Company's No. 22a.



The German Parcels Post.

Mr. Charles Henry Hull, an American student at a German university, presented as his thesis as a candidate for Doctor of Political Science a work (in German) entitled "The German Imperial Parcels Post," which he prepared, after a thorough investigation of the facts in the case, with the co-operation of the leading officials of the post office and railroad departments of the government, and which has attracted the attention and high commendation of leading railroad authorities.

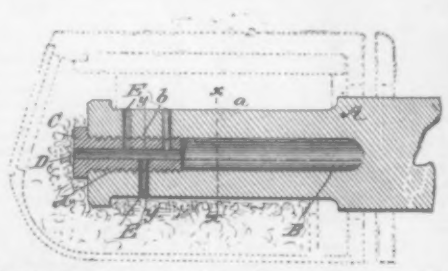
It seems that the requirement which the Prussian railroads have to fulfill of carrying the mails for the post-office department without any compensation is due largely to the opposition to the introduction of railroads on the part of Von Nagler, Postmaster-General at the time, who looked upon them as likely to prove destructive to the business of his department, which included the carriage of passengers in the mail coaches. Not being able to keep out the railroads, he insisted on prescribing that they should carry the mail free as a sort of indemnity to the post-office department for its loss of passenger transportation. It was then supposed that the railroads would simply charge tolls, like canals, and the original idea probably was that the post-office would run its own vehicles, and require of the railroads only the use of its tracks. However that may be, the law became general that the railroads should carry the mails free; and as time went on, the post-office department organized a huge system of parcels posts, at very low rates, which was and is very popular and a great convenience, yet profitable to the post-office, because the whole cost of carriage falls upon the railroads, which at the same time are deprived of what everywhere else affords the railroads a considerable profit.

Hull concludes that it is at least doubtful whether the gross receipts from the parcels post pay the actual expense connected with it, to say nothing of interest on the investment, though it yields the Post Office Department about $12,500,000 a year; and he gives instances to show how it diverts business from the freight traffic of the railroads. For instance, a single manufacturer in Glogau shipped at one time to a single merchant in Berlin more than half a carload of hat boxes, all in 12-cent parcels. Again, 213 little boxes of cheese were shipped in the same way from one shipper to one consignee. For some 40 days in 1891 there were daily arrivals of 4,000 to 5,000 baskets of string-beans, in the form of 11-lb. post office parcels, which all went to the Central Market in Berlin—that is, some 20 tons of vegetables were received daily by mail from Austria.

It might be supposed that at a time when nearly all the German railroads are State property it would matter less whether one department or another got the profit from them. Hull, however, thinks that the burden of carrying the mails might be a proper enough tax on private railroads; but that State railroads whose sole object should be to afford the maximum advantage to the public should be free to adjust their rates so that they will do the most good; and, when the Post Office department takes a part of the railroad profits, even if it cheapens the service of its own department, it may prevent a cheapening of other railroad service which might be of much greater advantage to the community than, for instance, the carriage of string-beans from Austria at less than cost. "To be sure," says Hull, "it is a good thing that numbers of Christmas presents and gilt-edged New Year's cards can be exchanged; but those who send them ought at least to pay the cost of the exchange. It is possible to overestimate the advantage to the poor man of a low charge for sending a parcel, especially if we neglect to consider how infrequently he wants to send one and how much more tax he has to pay to keep up an unprofitable parcels post, in order that Berlin society may deck their ball rooms in winter with fresh French flowers, or London ladies and gentlemen of the Primrose League wear primroses on the birthday of the late Lord Beaconsfield."

Connelly's Axle Lubricator.

Mr. J. Connelly, of Milton, Pa., has patented a method of lubricating car axles and crank-pins which has some novel features. Our illustration shows the method of improving the lubrication of car axle journals so clearly



that further description is hardly necessary. The lubricant enters the central chamber *B* through the hole *D* and flows out to the bearing surface through the openings *E*. The diameter of the chamber *B* is ¼ that of the journal and the holes *D* and *E* are ⅛ in. in diameter.

TECHNICAL.

Manufacturing and Business.

The Foster Engineering Co., of Newark, is furnishing the Foster valve to all the new government war ships, now building. The new cruisers, "No. 9" and "No. 10" will be equipped with them, as well as the "Cincinnati," the "Raleigh" and the "Maine."

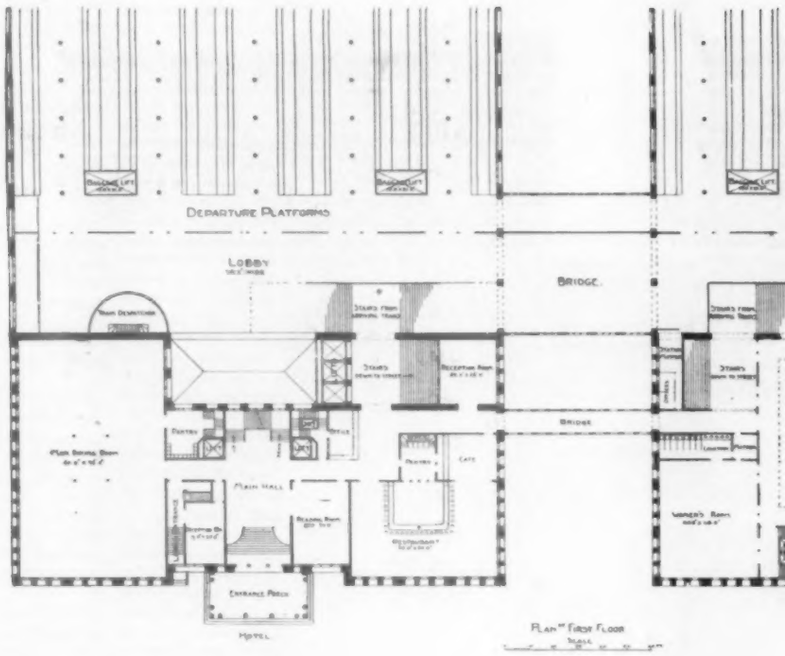
B. M. Jones & Co. have issued a circular announcing that "R. Mushet's special steel," is furnished in blanks for milling cutters, taps and dies, reamers, rose bits, countersink drills and twist drills. The cost of the steel (annealed), is 75 cents a lb. B. M. Jones & Co. are the sole representatives in the United States for Samuel Osborn & Co., Sheffield, Eng. The firm has offices at at 11 Oliver street, Boston, and No. 143 Liberty street, New York.

The Kalamazoo Railroad Velocipede & Car Co., of Kalamazoo, Mich., has just completed and shipped to the Leigh Valley 180 sets of the new Kalamazoo steel surface cattle guards. The company is running its factory night and day, and is now two months behind on orders for hand cars and cattle guards. The new steel wheel hand car is already used by many of the largest systems.

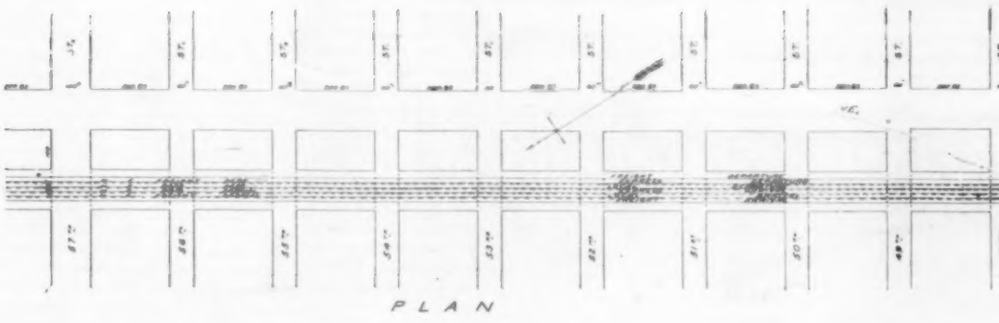
The Yale & Towne Manufacturing Co. has issued a circular announcing the lease by that Company of the Branford Lock Works, which manufactures a line of medium grade locks and hardware. The products of the two establishments will be kept entirely distinct and separate.

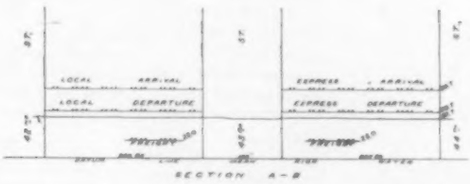
The National Switch and Signal Co. now located at South Easton, Pa., will move to Odenweldertown, and erect extensive buildings on about 10 acres of ground. The city has released the company from taxation for 15 years.

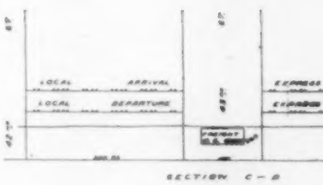
The Baltimore & Ohio shops at Martinsburg, W. Va., are now working full time, 10 hours a day. The force is engaged chiefly overhauling locomotives and freight cars.

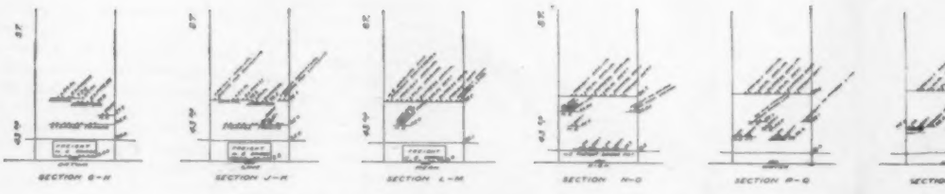


First Floor Plan.

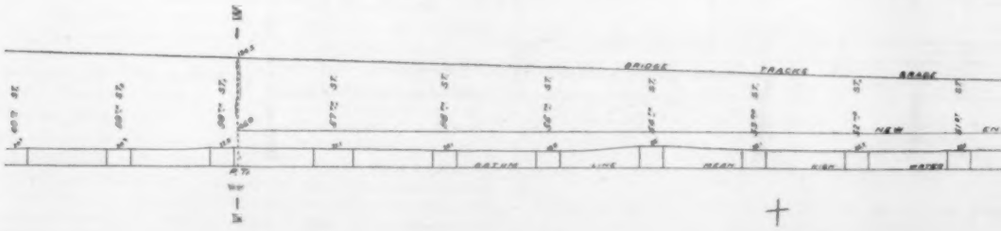


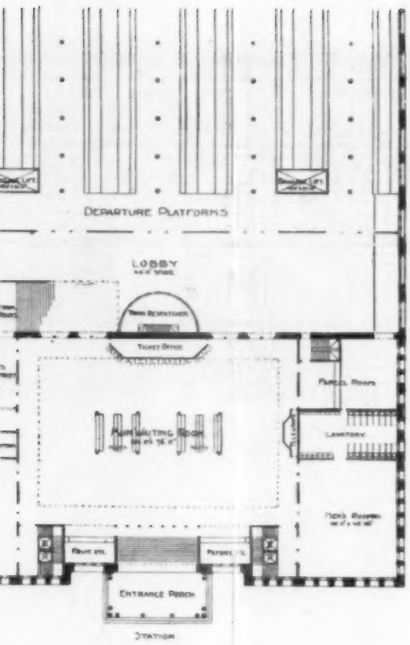


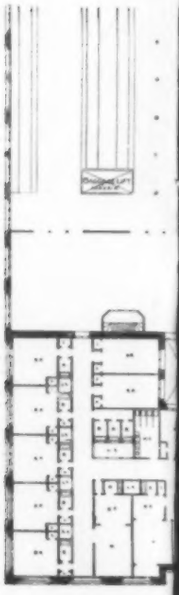


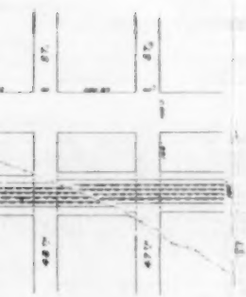


VERTICAL CROSS SECTIONS THRO VIADUCT AND TERMIN



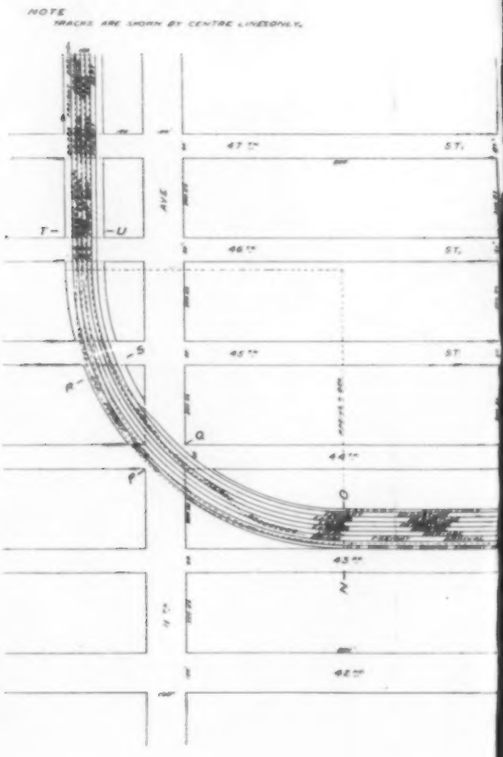


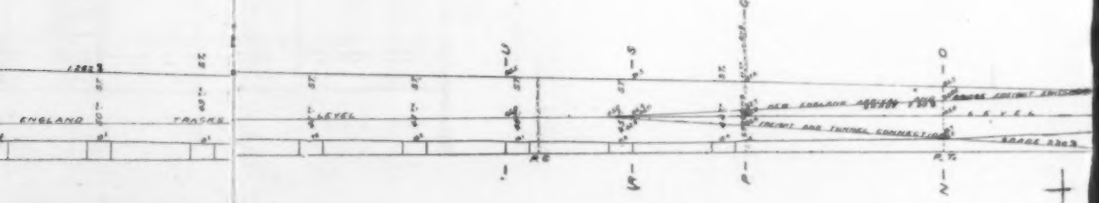




RMINAL STATION

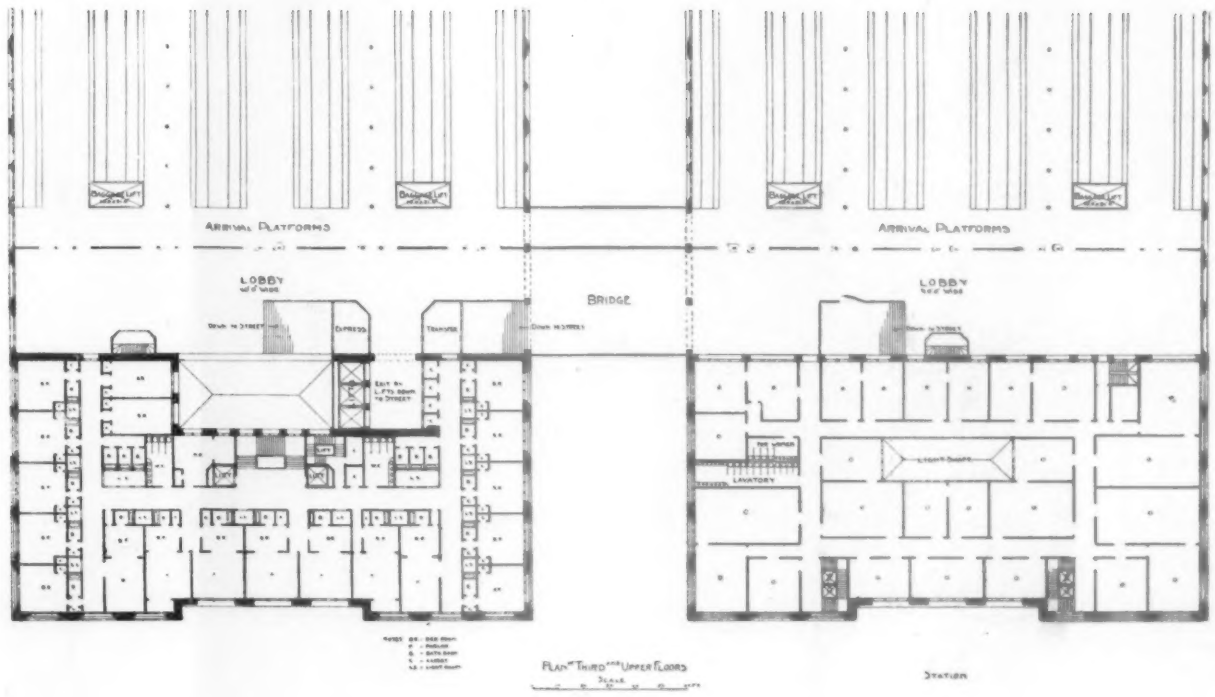
Plan and Sections of Viaduct and Terminal Tracks.





PROPOSED NEW

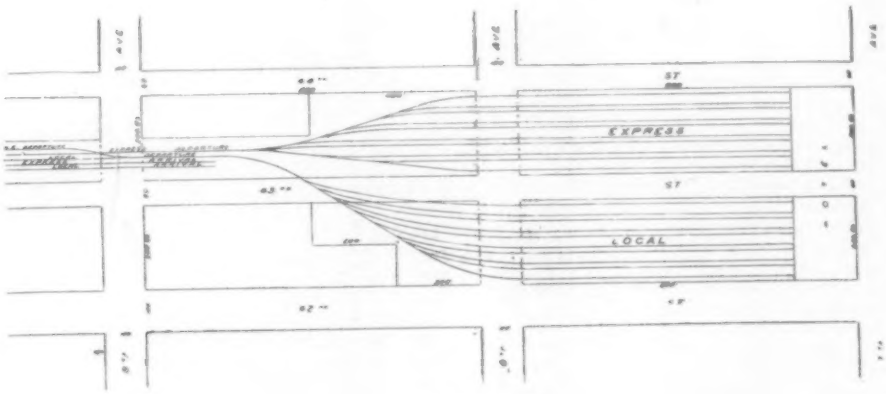
Mr. T. C. CLARKE, *Chief*

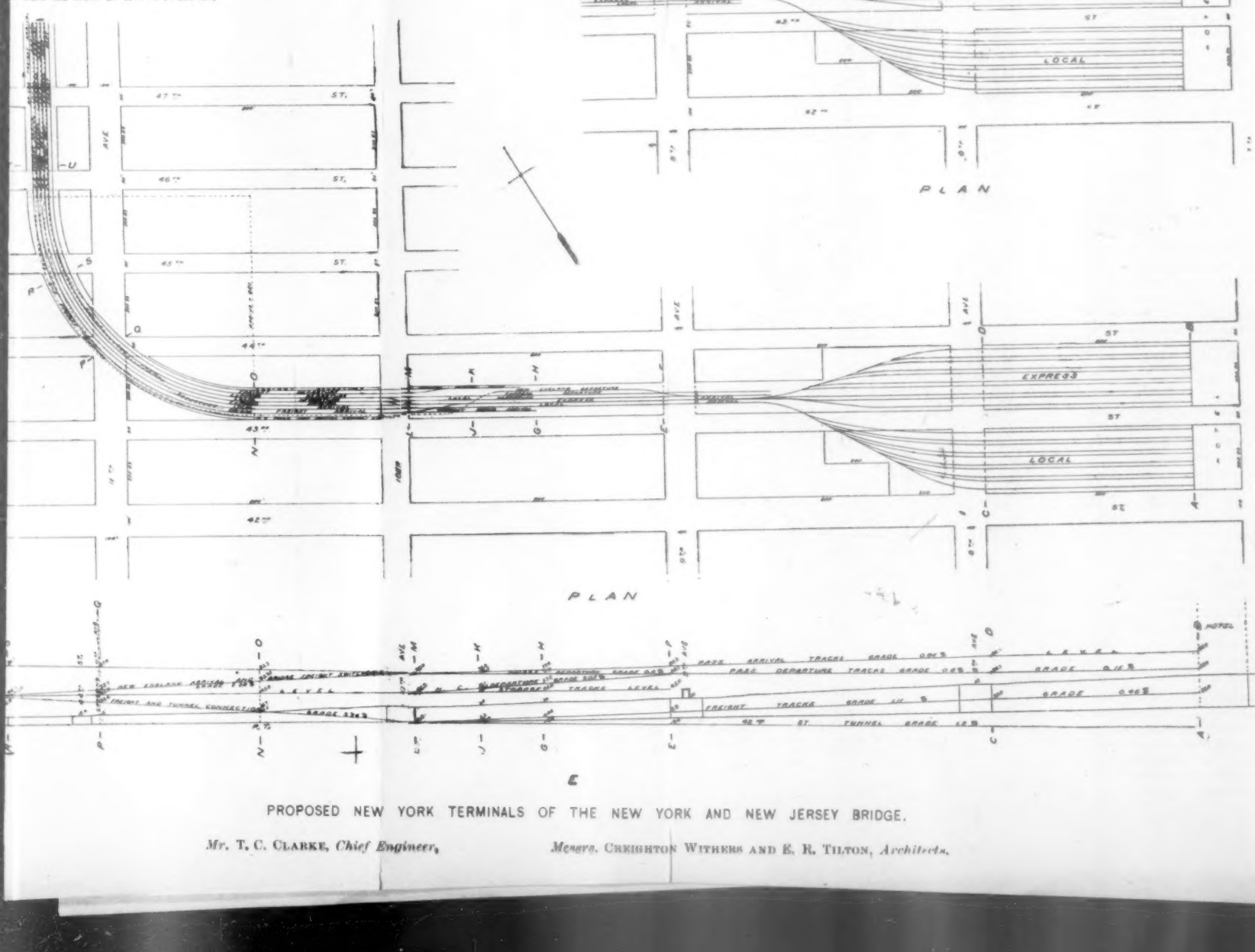


Third and Upper Floor Plan.

...ions of Viaduct and Terminal Tracks.

...TRACKS ARE SHOWN BY CENTRE LINES ONLY.





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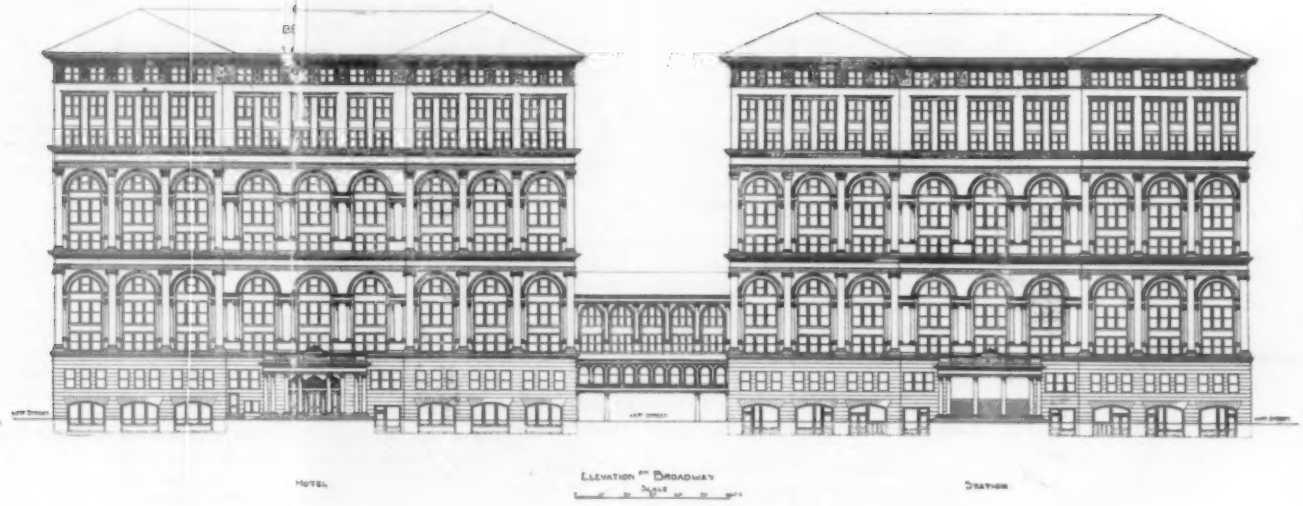
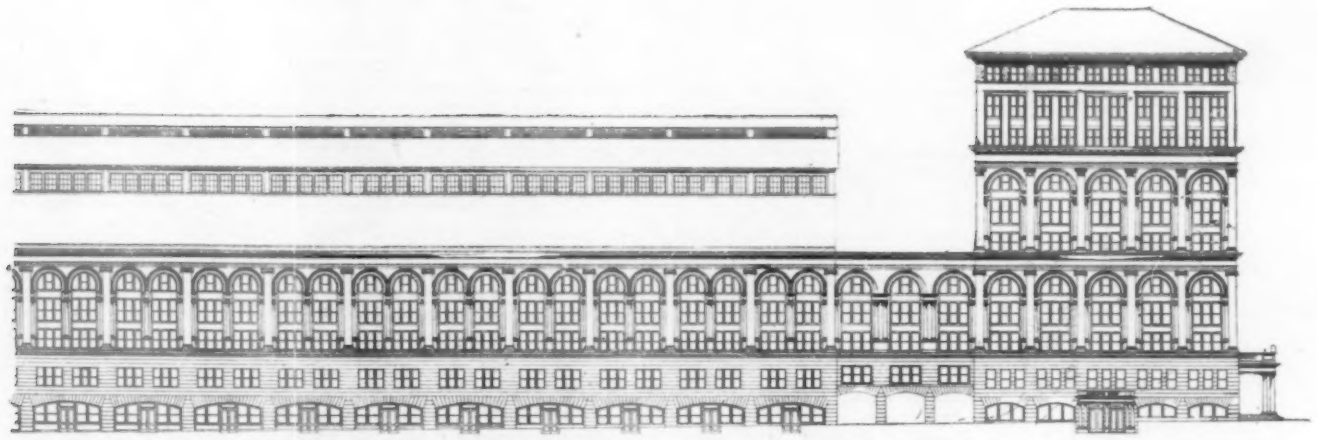
PROPOSED NEW YORK TERMINALS OF THE NEW YORK AND NEW JERSEY BRIDGE.

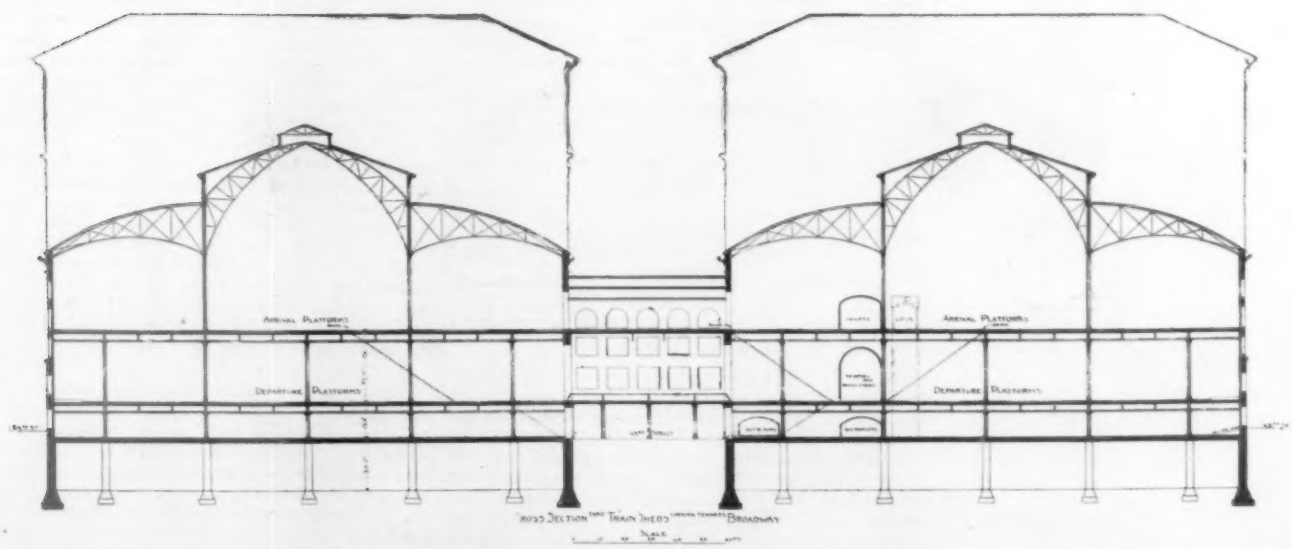
Mr. T. C. CLARKE, *Chief Engineer,* *Messrs.* CREIGHTON WITHERS AND E. R. TILTON, *Architects.*



Front Elevation.



Side Elevation.



Cross Section of Train Shed, Showing Arrival and Departure Platforms.

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The Columbian Steam Pump Company is building a factory for the manufacture of irrigating, railroad water tank and other pumps, at St. Paul, Minn. The machine and erecting shops will be 50 × 150 ft. in dimension. Other buildings included in the plant are engine and boiler house, tool house and pattern room.

New Stations and Shops.

The Union Pacific is preparing to erect a substantial and much needed passenger station at Colorado Springs, Col.

The Northern Pacific has built a passenger station at South Bend, Wash. A six stall brick roundhouse is in course of construction.

The foundation for the new union station of the Norfolk & Western, Huntington & Big Sandy, and Ohio River Railroad, at Kenova, W. Va., is completed and work has been begun on the superstructure. The building will be a large ornamental structure in yellow brick and faced with stone.

Work has been commenced on the Union station of the Baltimore & Ohio, Monongahela River and West Virginia & Pittsburgh, at Clarksburg, W. Va.

Work is now being pushed with all possible rapidity on the new passenger station of the Ohio River Railroad at Huntington, W. Va., to have it completed by Oct. 1, when the new line from Guyandotte into Huntington will be opened. This station will be the finest and most complete on the line of the Ohio River road. A new freight house will be located immediately east of the passenger station. The piling for the foundation of this building is now being driven. The Ohio River Railroad has prepared plans for a new passenger station and freight house at Moundsville, W. Va.

The Eusign Car & Mfg. Co., of Huntington, W. Va., has recently made extensive improvements, erecting new buildings and putting in considerable machinery, the most important being a machine for making coupling pins and links, and another for working up scrap into nuts, bolts and chains.

Long Rails.

The steel rails now standard on the East Indian Railway are 36 ft. long. The advantage in the saving of joints is obvious, and it is said that the track is much smoother.

The Cruiser "Cincinnati."

The protected cruiser "Cincinnati," launched from the Brooklyn Navy Yard this week, has a length of 300 ft. on the load water line, an extreme breadth of 42 ft., a mean draught of 18 ft., and a displacement of 3,183 tons. Her engines will be of the triple expansion type, driving twin screws, and are expected to develop 10,000 H. P. with steam at 160 lbs. pressure, that is to be generated in boilers working under a forced draught. The prescribed speed is 19 knots per hour, but judging from the performances of the "Newark," "Charleston" and "Baltimore," it is expected that 20 knots will be attained. The armament of the "Cincinnati" will consist, in the main battery, of one six-inch breech-loading rifle, mounted on the forecastle, and training through an arc of 270 degrees, and ten five-inch rapid fire guns, two of them mounted aft, and the other eight upon the gun deck in spans. The secondary battery will consist of eight six-pounder and four one-pounder rapid fire guns, and two Gatlings, the latter being mounted in the tops. There are also six above-water torpedo tubes, of which those ahead and astern are fixed, while the others are training tubes. The conning tower will be two inches thick. In the various details of lighting, ventilation, and so on, the "Cincinnati" will be well up to modern requirements.

A Schenectady Compound.

The Schenectady compound locomotive in use on the Chicago & Northwestern has been running in freight and passenger service, and has given excellent satisfaction. It has not been thoroughly tested yet, but Mr. Smith, Superintendent of Motive Power, is very much pleased with it and speaks very highly of its performance.

The Four Mile Tunnel for the Chicago Water Works.

This tunnel is now very nearly ready for use. Some dredging remains to be done at the four-mile crib and about 1¼ miles in each of the six-foot tunnels remains to be cleaned out. This work will be done soon, and the only other cause for delay in opening the tunnel is the construction of gates to close off the branch tunnels at the shaft near Park Row. It is expected that this work will be wholly completed by Oct. 10. In the *Railroad Gazette* of Aug. 19 reference was made to the terms of settlement with the contractor. The board of arbitration then appointed consisted of the finance committee of the city council, and they have awarded the contractor $148,000 in settlement of the claims for extra labor and material. As the claims filed amounted to nearly $250,000, this settlement is naturally not satisfactory to the contractor, but it is understood it will be accepted by him as a final settlement for this part of the work.

The Mason Air Signal.

The Mason Air Brake & Signal Company of Chicago has issued a pamphlet describing, with illustrations, its system of train signaling by compressed air. A separate line of three-quarter inch pipe is used, extending the length of the train, and the whistle in the engineman's cab is operated by venting air from the pipe. The standard pressure for the train-pipe is 60 lbs., although for 15 cars or under, the apparatus, it is said, will work with a train-pipe pressure of 30 lbs., which allows a large margin for leakage. The system consists in the main of the engineer's signal valve, an equalizing reservoir, a signal valve, signal valve reservoir and whistle and the conductor's valve. The engineer's signal valve enables the engineman to throw the signal system into or out of operation, and to modify its action for a long or a short train. The device contains a reducing valve and a check valve, to prevent the return of pressure from the train-pipe to the air supply. It also has a graduating valve to regulate the flow of the air to the train-pipe. The equalizing reservoir is cut into communication with the signal pipe by the engineer's valve, and operates to prevent the signal from being sounded more than once by a single impulse. The signal valve operates by differential pressure, and any sudden reduction of pressure in the train-pipe causes a piston to lift by the reservoir pressure, opening communication with the whistle, which is sounded by air escaping from the reservoir. It is said that the action of the piston is quick, and a sharp and clear blast is obtained. A conductor's valve is placed on each car and is in communication with the train-pipe. When open it will vent neither more nor less than a certain pressure from the pipe, thus causing uniform action of the whistle, and preventing waste of air. The train-pipe is charged from the brake-pipe through a reducing valve.

A Steam Motor for Street Railroad Use.

The compound motor imported by the North Chicago (Street) Railroad Co. some months ago is in daily use on their lines and is giving excellent satisfaction. It is used principally to haul cars from the electric loop line which was described in a recent issue of the *Railroad Gazette* to the cable line on Lincoln Ave. In addition to this the company has found the motor particularly useful in clearing the track and expediting the service generally in case of accident to the cable. It has hauled as many as 11 heavy street cars in a train in such service.

This motor is a two-cylinder compound locomotive, but is entirely inclosed, as has been the practice with other motors intended for street service. The exhaust steam passes into exposed coils on the roof of the car, and thence to a tank from which the condensed water is returned to the boiler. Ordinarily the steam is entirely condensed so that no vapor escapes into the atmosphere. When hauling heavy loads there is some slight escape of steam, but even under these circumstances there is no noise. Coke is used for fuel and there is therefore no smoke. This motor has proved so satisfactory to the management that an exact duplicate has been ordered from the Baldwin Locomotive Works, which it is expected will be delivered in a short time.

The Trolley in New York.

The electric trolley cars have begun running on the Third Avenue branch of the Union Railroad Company, or "Huckleberry lines," so called. Twelve cars were sent out Sunday. The lines of this company are: the Third Avenue, the Boston Avenue, the Westchester Avenue and the 138th Street lines. The company has contracted with the St. Louis Car Company for 60 cars, 40 of which are to be delivered within the next fortnight. The electric plant is from the Thomson-Houston Co. and a station has been built on the Bronx River with capacity to run 100 cars.

The Jordan Train Signal.

An exhibition of the Jordan electric train signal system on the Portland & Rochester road was given at Portland, Me., Sept. 21.

Dry Dock at West Superior.

The dry dock of the American Steel Barge Company, of West Superior, Wis., is completed. It was tested on the 15th inst. This dock is the largest on the Great Lakes, and can be emptied in two and one-half hours.

New Transatlantic Steamers.

President C. A. Griscom, of the Inman line, is quoted in the Philadelphia papers as stating that his company will build five new transatlantic steamers, and that the contract will be awarded to the Cramp works, which will have three years to build them. "These ships will be fitted to carry guns and will be constructed so that they may be used as naval cruisers. They will attain a speed of 20 knots and will have twin screws."

The White Star Company has commissioned the Belfast shipbuilders, Harland & Wolf, to build an Atlantic steamer to be "the largest and fastest vessel in the world." She has already been named "Gigantic," and will be 700 ft. long, 65 ft. 7½ in. beam, 4,500 H. P. It is calculated that she will steam 22 knots an hour, with a maximum speed of 27 knots. She is to be ready for sea in March, 1894. The new boat will be 80 ft. longer than the new Cunarders, but about the same beam, and her tonnage will be about 2,500 greater than that of the "Campania."

Lengthening the Steamer "Albany."

The steamer "Albany," of the New York & Albany day line, will be steamed to the shops of the Harlan & Hollingsworth Co., at Wilmington, Del., and will be cut in two forward of the wheels and have 16 ft. added to her length. A new pair of scattering wheels will be put in, similar to those of the steamer "New York" of the same line, together with new shafts and new connecting rods. It is expected that the speed of the boat will be materially increased by the operation, which will be expensive.

Master Car Builders' Association.

SUBJECTS AND COMMITTEES FOR CONVENTION, JUNE, 1893.

The following Committees have been appointed:

1. *Drawbars and Brake Beams.*—To consider the suggestions of the Committee on Standards, as to standard height of drawbars, and as to standard form of brake beam, and report with recommendations and drawings in detail. E. N. Nelson, John Bean, J. R. Rankin, C. A. Schroyer.

2. *Axles, Journal Boxes, Lids and Wedges.*—To consider the suggestions of the Committee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. R. H. Soule, W. H. Da, W. H. Lewis.

3. *Truck Pedestals and Safety Chains.*—To consider the suggestions of the Committee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. T. A. Bissell, Wm. McWood, A. E. Mitchell.

4. *Protection of Trainmen and Lettering Fast Freight Line Cars.*—To consider the suggestions of the Commitee on Standards, and to recommend in detail, with drawings, how these standards should be modified and published. E. P. Lord, Robert Walker, Thos. Sutherland.

5. *Tests of M. C. B. Couplers.*—To arrange for and conduct the tests, as proposed by the Committee of 1892 and approved by the convention, and to consider and report upon all other questions connected with the M. C. B. coupler which they might consider advisable, with the exception of the attachment at the rear end of the coupler and the form of the coupler at that point. To confer with the Committee on Attachment of M. C. B. Couplers to Cars. J. M. Wallis, J. S. Lentz, R. D. Wade, J. H. McConnell, E. Chamberlain, T. G. Duncan.

6. *Attachment of M. C. B. Coupler to Cars.*—To recommend a form, in detail, of M. C. B. coupler at rear, and so as to take yoke, tail bolt and continuous drawbar attachments; also, to consider and report upon the best form of draft attachment to cars. To confer with Committee on Tests of M. C. B. Couplers. E. D. Bronner, W. H. Harrison, A. M. Waitt, Wm. Garstang, A. Dolbeer, Jno. H. Davis.

7. *Metal for Brake Shoes.*—To investigate the relative friction and wear of different metals and different shoes in general use on chilled treads and on steel tires. Wm. Forsyth, Benjamin Welsh, F. D. Adams.

8. *Cast Iron Wheels.*—To investigate and report whether there is any substantial difference in wheels made by different methods, such as by solid chills or contracting chills, or by any other difference in process of manufacture. G. W. West, W. H. Thomas, Jno. Player.

9. *Steel-Tired Wheels.*—To investigate further and report with all data available as to relative values in service. R. E. Marshall, J. O. Pattee, C. H. Cory.

10. *Air Brake Tests.*—To further investigate and report in detail what tests are desirable to insure best available service. G. W. Rhodes, E. B. Wall, Geo. Gibbs, A. S. Vogt, E. A. Williams.

11. *Freight Car Truck Frames.*—To include in its report the relative advantages of fixed bolsters and swing bolsters. J. C. Barber, W. S. Morris, S. A. Crone.

12. *Steel Centre Sills.*—To consider and report whether the use of steel for centre sills in freight cars would be desirable. D. L. Barnes, J. N. Barr, J. D. McIlwain.

13. *Steam Heating and Ventilation of Passenger Cars.*—To review the report of last year's Committee on this subject, which was acted on provisionally, and to recommend any changes that may be deemed proper; also, to further pursue the subject of steam heating in general, informing the Association as to what improvement, if any, is being made over the methods now in use. L. B. Paxson, J. J. Hennessy, Jos. Townsend, John Hodge, David White.

Test of Meneely Rolling Bearings.

The following tests of the Meneely tubular bearings for car journals were made by Delaware & Hudson Canal Co., Sept. 17, 1892, with Belt Line trains of four cars, each train weighing 102 tons.

Coal Test.

Brass Bearings: Consumption in running 18 round trips (270 miles)	14,800 lbs.
Tubular Bearings: Consumption in running 18 round trips (270 miles)	11,100 lbs.
Excess of consumption with brass bearings, 33⅓	3,700 lbs.

Dynamometer Test.

Brass Bearings: Power required to start train	3,276 lbs.
Tubular Bearings: Power required to start train	252 lbs.
Ratio of required power, 13 to 1.	

Gravity Test.

Brass Bearings: Distance run from foot of grade	100 feet.
Tubular Bearings: Distance run from foot of grade	534 feet.

Ordnance Contracts.

Contracts have been awarded by the War Department for ordnance material for the army. The Midvale Steel Co. will furnish, under its contract, 25 sets of forgings for 3 2-10 in. guns, 10 sets of forgings for 5 in. siege guns, 10 sets or forgings for 7 in. siege howitzers and 10 sets of forgings for 8 in. guns. The Bethlehem Iron Co. will furnish 12 sets of 10 in. forgings, 9 sets of 12 in. forgings, and 7 sets of 12 in. steel mortar forgings. The contract for 12 in. steel armor piercing shot has not yet been awarded. The lowest bidder was the Sterling Steel Co. The Midvale contract amounts to $250,000, and the Bethlehem contract to $700,000.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Before the West Cambridge disaster is out of people's minds we have to chronicle a horrible butting collision on one of the lines of the Pennsylvania (west of Pittsburgh), a company whose railroad system is often spoken of as the best in the country and which has just issued a specially elegant pamphlet inviting Europeans and others to travel on its trains to the World's Fair. We have often drawn attention to possible improvements in discipline by which the likelihood of blunders like this can be largely reduced, and we have no doubt that these possibilities will point a moral in the case of the Shreve collision; but for various well known reasons the immediate moral is, doubtless, Introduce the block system. There is no use in recommending that to the company here interested, however, for it uses the block system on some parts of its line already. The question why it is not used more extensively is one which the public will begin to take an active interest in, if disasters like this continue to draw public attention to it. The public of Ohio, which controls this road, has an instructive object lesson in the New York, Pennsylvania & Ohio, which is block signaled its whole length, and Ohio legislators may be expected to try their hands at compulsion. They know they cannot compel good discipline on fine points, but a law to enforce the block system is a simpler matter.

From the tables published in the *Railroad Gazette* last week it appears that the performance of the Dean compound in comparison with the Old Colony simple locomotives may be summarized as follows: In express freight service the records are given for four round trips of 98 miles each. The train weights are very nearly the same, there being but 2¼ tons difference, in the average, in favor of the compound. The rate of combustion was 28.5 lbs. of coal per sq. ft. of grate per hour more with the simple engine than with the compound. The evaporation in the compound was 1.95 lbs. of water per lb. of coal more than in the simple engine. The per cent. of the total combustible consumed was slightly less with the compound than with the simple engine. There was more coal lost by dropping through the grates, but less was drawn through the tubes. With a steam pressure about 15.4 lbs. higher, the average saving effected by the compound in freight service was 31.9 per cent. in coal per car mile and 13.3 per cent. saving in water per car mile. In passenger service a comparison of the average of six round trips of the simple engine in November, 1889, with the same number of trips of the compound in May, 1892, the length of the round trip being 88 miles, shows that the saving of coal by the compound was 29.6 per cent., with an average train weighing 3.2 tons more than that with the simple engine, and with a steam pressure about 30 lbs. higher. It is to be noted that these tests show, as has been shown in many previous tests, that a large proportion of the saving of the compound is due in many cases to the increased efficiency of the boiler, the evaporation per lb. of coal being so much higher with the compound.

Our esteemed contemporary, *The Railroad and Engineering Journal*, in the course of an article on compound locomotives in a recent issue, expresses the opinion that the report of the committee of the Master Mechanics' Association on this subject last year must have been disappointing to those desiring information as to the actual saving which may be expected by the use of the compound system, on account of the inconclusiveness of the report. Objection is made (or implied) to the use of indicators, dynamometers and other instruments used in scientific tests, and it is suggested that a series of comparative tests extending over a considerable interval of time in the same class of service would settle the question which is of most importance to railroad managers, namely, how much coal will be burned by a compound engine and how much by a simple engine of like size and weight and under like conditions. As we understand it, the figures from which such a conclusion as our contemporary desires to have drawn are contained in the report to which he refers. As a matter of fact, the two engines tested by the committee were run for a period of about one month each, in the same kind of service, and the particulars as to fuel consumption, train weights, etc., are duly recorded in the report. The fact that a dynamometer car and various instruments were used for recording data does not prevent the drawing of any conclusion which our contemporary finds can be drawn from the actual work done. The committee tested the only compound locomotive which they had an opportunity to test, against a simple engine closely corresponding to it. The report shows the actual and relative coal and water consumption figured on a ton mileage basis, and also on the basis of the dynamometer work. The various attachments in the very complete dynamometer car provided by the Chicago, Milwaukee & St. Paul were used simply for the purpose of procuring additional information which might probably be of value; and we see nothing to prevent our contemporary from striking out all of the dynamometer car records, indicator diagrams, safety-valve and air-pump records, and anything else that he sees fit, and drawing his own conclusions on the basis of the number of cars or of the number of tons hauled; or, in fact, striking out just as much of the elaborateness of report as he pleases, and drawing his conclusions from what is left.

In the latest "Bulletin" of the American Society of Civil Engineers the attention of members is called to certain clauses in the constitution to the effect that the objects of the Society are to advance engineering knowledge and practice among its members, and that every person who has joined the Society since January, 1891, has agreed to aid its objects by furnishing papers and discussions. It is considered that by inference older members are equally bound to promote these objects, and it is said that "whenever, as is too often the case, the first description of an important work is sent elsewhere, a member not only violates this obligation, but he loses .... the enhanced standing in the profession which the presentation of an important paper before the Society invariably brings." It is urged upon members, therefore, that they fulfill their obligations in the matter of writing and discussing papers for and before the Society. Doubtless it is quite right and proper that the officers should be urgent in stimulating members to contribute papers. In fact, it is their duty to advance the interests of the Society in this way, but it is not so obvious that the argument brought forward is the best one or a conclusive one, and the "Bulletin" puts the Society into direct competition with technical journals in securing papers. Members are invited to judge, without sentiment, of the material advantage to themselves of sending their papers to the Society or to the technical journals. Perhaps it would have been better to appeal to them on the higher and less personal ground of their duty in promoting the growth and glory of the Society. A member may be supposed to do a good deal for these purposes and but little for the honor of a technical paper. In his relations to the Society higher sentiment enters; in his relations to a journal he stands on the ground of pure business. Now the *Railroad Gazette* must be included in the "elsewhere" of the "Bulletin," but the *Railroad Gazette* offers to members of the American Society of Civil Engineers the "enhanced standing in the profession" which comes from their being known as authors of important papers, and it offers this, perhaps, in quité as great a degree as the *Transactions* of the Society. That, of course, is largely a matter of opinion, but it must be remembered that the audience of the *Railroad Gazette* is much larger than that of the *Transactions;* that the *Railroad Gazette* goes to technical and learned societies and to libraries, that the valuable articles appearing in it are reprinted in all the languages of the civilized world, that abstracts from them are made in the printed papers of engineering societies, and that, taken all in all, they probably receive a good deal more attention than do those papers which appear only in the *Transactions*. Of course papers appearing in the *Transactions* are also more or less freely reprinted in the technical journals, and thus their audience is enlarged. But, on the whole, the advantages in these particulars are probably on the side of the *Railroad Gazette*. Further than that, the member of the American Society who sends a paper to the *Railroad Gazette* gets paid for it if he wants pay; and when we put the matter on the ground of material advantage, the money element is not to be ignored. It appears, therefore, as if the competition challenged by the "Bulletin" were rather an unequal one.

We have repeatedly in the last year or two called attention to the fact that very high train speeds are now more a question of safety than of power. Engines now running make 70 miles an hour and upward, and have made more than 90, hauling trains. Of course we do not say that 90 miles an hour or even 70 is a possible journey speed with existing engines, but such speeds can be made for short distances, with trains, and are made in practice; and the limit of power of the locomotive is not reached or even accurately estimated. Competition is pushing up the journey speed all the time, and as the average speed of the run increases, the speed for short distances increases even faster to make up for delays, foreseen and unforeseen, so we hear now constantly of pretty long runs made at over 60 miles an hour. We have not yet heard of serious accidents at very high speeds, chiefly because the fastest trains are still few, and partly because extra care is taken to clear the way for them. But with the best practicable signaling and with every precaution in operating, the danger of these very high speeds, say above 60 miles an hour, is great, and we are glad to be able to publish to-day a letter from the highest living authority on brakes calling attention to that danger. Mr. Westinghouse says that with the best fitted trains, and brakes in perfect order it would take 18 seconds to bring the speed of a train down from 90 to 60 miles an hour, and that the train would have run 1,796 ft. in that time. The distance run from application of brakes to a full stop would probably be about 3,000 ft. But this is under the best working conditions. With a perfect brake, and a braking force of at least three times the weight of the train these distances could be considerably reduced, as shown in Mr. Westinghouse's table 1; but every railroad officer knows that in practice they are a good deal more likely to be increased than reduced for a long time to come. It is possible to protect passenger trains by fixed signals that shall give certain warning 3,000 ft. or more from fixed danger points; but how about the unforeseen dangers? Unfortunately they have not been eliminated yet. And beyond all this lies the fact that no one really knows how a brake will act at 90 miles an hour. It may be that the established laws do not hold good at so high a speed.

The Southern Pacific has given notice of withdrawal from the Western Traffic Association, which probably includes a withdrawal from the Trans-continental association also. This makes the fourth or fifth notice of the kind now in effect, and strengthens the opinion, now freely advanced, that the life of the Western Traffic Association is only a matter of weeks. The Chicago, Burlington & Quincy has given notice that it would withdraw from this latter association, and the Great Northern, the Northern Pacific and the Canadian Pacific have given similar notices to the Trans-continental association. The Union Pacific is likely soon to withdraw from the Trans-continental. All this means the abandonment of the Trans-continental on Jan. 1 and, with the failure of the lines in the Southwestern Railway & Steamship Association to harmonize their differences, added to the present apathy of most of the lines in the Western Traffic Association, points strongly to the abandonment of all three associations at an early date. At present the prospect of a large freight movement on all the lines is so good that probably no serious harm will immediately ensue, but well-informed traffic officers do not feel at all confident that rates west of Chicago can be maintained for any great length of time, and freely predict a general demoralization in the near future unless a new association can be established before the present notices take effect. Probably some kind of an organization will be formed to supersede the two subsidiary associations,

but the territory that they cover is so scattered and therefore so subject to strong outside competitive influences that it is hard to see how much cohesive power can be given to any kind of a rate agreement. Even a pool would be hard to maintain, for the reason that the very first question, what traffic should be included in the pool, is the hardest one of all. The cohesive power of all associations is of a doubtful quality nowadays, and in many cases is growing more doubtful, but the associations are by no means without their value nevertheless; and so it is unlikely that the roads in the above-named associations will sit idle and make no attempts at union. The situation is in that anomalous condition where a rope of sand seems to be a little better than no rope at all. The larger association (the Western Traffic) is a marked example of an association which has little to hold it together but which has done much good. Mr. Walker's decisions and reports, concurred in as they have been by his able advisers, have derived their value, not from his position at the head of a large association, but from their inherent merit and justice. The association was formed for Wall street purposes, but its dissolution will be a matter of regret to everybody who has at heart the best interests of the railroads, nevertheless, for Wall street interests are not all illegitimate by any means. The association began its life in January, 1891, and its speedy death was freely predicted before it had fairly begun work, but it has endured until now, and unquestionably has been of great public service. How great that service has been it is impossible to estimate, because such an important part of it has been negative; that is, has prevented rate reduction and other troubles that would otherwise have happened.

The Never-Ending Whistle-Racket.

The people of Bayonne, N. J., near the eastern end of the two-mile bridge of the Central Railroad of New Jersey across Newark Bay, have been greatly annoyed by the whistling of the locomotives of that road, and finally, about three weeks ago, they made a formal complaint to the Chancery Court at Trenton, asking for an injunction against the company. This week we have the somewhat surprising report that Chancellor McGill has refused to grant the injunction. The attorneys of the road asserted that the whistling was necessary, and the Chancellor seems to have taken their word for it. The fact that the road wishes to continue the noise is even more surprising than the Chancellor's approval of the wish. Most railroad officers, especially those whose residences are near a switching yard, are glad enough to order the abolition of whistling, provided they can get a decision from a court compelling it, so that they will be free from liability from accidents that may be alleged to be due to the absence of a whistle warning. The Bayonne complaint certainly seems reasonable, for the affidavits showed from 40 to 75 blasts an hour, at certain times when watchers counted them. The report says:

> Charles J. Spenser, in his affidavit, states that it is invariably the rule that an engine coming from Elizabethport, as soon as it strikes the bridge, will give five shrill blasts, and when it reaches the draw it will give five more and still five more when it passes through the draw. Martin R. Cook says it is impossible to hold a conversation in the evening, if sitting on the piazza or with the windows open. The shrieks of the locomotive whistles are constant, and are so shrill and alarming that he has come to the conclusion that they are frequently made for the purpose of waking the switchmen. Albert L. Walton figures that a locomotive, in passing across Newark Bay, will give 35 blasts. William H. Daly says that he is obliged to suspend all conversation when sitting on the piazza, because of the constant interruption by the noise of the shrieking whistles.

These statements are probably not exaggerated. Everyone knows of cases of the same kind, if not of the same degree of devilishness. The only question is whether the few thousand people of Bayonne should receive the same consideration as the many thousands in New York, Philadelphia and other cities at whose request whistles are silenced. And this question answers itself, for those who have adopted the rule of whistling only when there is actual impending danger have found it in every way desirable and satisfactory, even where there is only one person, or no person at all, to be annoyed by the noise. This rule has been adopted in large yards like the Grand Central station, New York; at crossings guarded by gates or flagmen in Massachusetts and New York; at large freight yards like Altoona, and in various other situations.

To sound a whistle to announce to a signalman that a train approaching a junction is to be thrown upon a certain route is, in this age of electricity, a relic of barbarism; at all events, it is so on any road where stations or signalmen are close together. If a road through a place like Bayonne is unfenced that is another relic of barbarism. If pedestrians are allowed on the Newark Bay bridge they ought to be fenced off. If whistles are blown there because the location is remote from dwellings, chime whistles ought to be used. We do not say this because we deem whistles necessary for any of the signaling here referred to, but as a reminder of the duty of railroads in sparse country districts; for if there is any possibility of getting a loud and harsh noise out of a whistle there will always be runners who will get it out, if the habitual use of the whistle is allowed at all. The strictness of discipline necessary to make enginemen use a whistle, and use it with moderation, seems to involve a degree of care and attention that most superintendents do not feel equal to. This being so, the most practicable rule is that of the Connecticut Railroad Commissioners; that is, provide a whistle which cannot be made to screech. But in thickly settled districts the only proper rule is, No whistling except when the engineman sees danger. The Central of New Jersey and Chancellor McGill are clearly behind the times.

While we are on the subject there is one other point. The writer of these lines, with several hundred neighbors, was much annoyed recently by the loud whistling of one careless engineman, doing switching at night. An application to the superintendent completely and satisfactorily silenced the offender, so far as concerns the whistling which was admittedly unnecessary; but the same runner continues every night to awaken some dozens of sick infants and tired or nervous old women—not including the editor—by blowing the four-blast signal to call in his flagman. This he does several times each night, and his whistle spindle is bent so that the sound is never clear cut as it ought to be. The Presidential election may be affected by this, as the "wigwam" of one of the parties is near by, and the speakers therein are obliged to suspend their arguments whenever that flagman has to be called in. The superintendent has not been asked to employ a boy to go out and order in the flag; nor to depend upon the fixed signals exclusively, as would be done at a large yard or at any point on an English road; but in view of the fact that a committee of the American Railway Association have reported that they regard the whistle as of doubtful safety for calling in flagmen (because the man may come in prematurely in response to some other train's whistle); that English roads do little or none of this kind of signaling, and that American roads will probably achieve the reform some time, it is a pertinent question, Why not do something about it now? The fact that thousands of patient people put up with a nuisance affords no warrant to a railroad superintendent to continue imposing it upon them.

Courtesy as an Investment.

A gentleman who has recently had occasion to visit in succession the passenger stations of two railroads which have their terminals in a neighboring city, and who waited some time for incoming trains in each, tells us that he was much impressed by the marked difference in the general social atmosphere of the two stations and in the manner with which passengers appeared to be regarded by the employés of the two companies. In one case there are no gates or barriers, and patrons of the road are free to come and go as they will, but efforts are made to prevent passengers from taking the wrong train by carefully announcing the trains, by indicators showing their destination, and by employés stationed on the station platforms and at the car steps. In the other case the passenger must force his way through a narrow passage, have his ticket punched, and after having escaped from the waiting-room he is allowed to find his train by means of the indicators and by asking questions if he sees fit.

In the former instance the general impression which a passenger receives is that the management is pleased to have him there, and that the employés like to answer questions and direct the stranger. In the latter the impression is one of espionage and suspicion; the gateman examines the passenger's ticket with an air which says: "There is probably something the matter with this, you are trying to get ahead of the company some way, but if I can't find any reason for stopping you I'll let you go through, but—move along lively now." In one case the prospective passenger is apparently assumed to be all right until he shows that he is not; in the other the assumption is the exact reverse, and he must establish his right to be there.

We have no intention of advocating the abandonment of gates and the inspection of tickets, for the system is most valuable in preventing errors, delays, and accidents. But from our own observation we know that there are grounds for the impression which our informant received, and it may probably be questioned if the gates system, by reason of placing the station employés to a certain extent in the position of being on guard against the traveling public, has not gradually developed a feeling of antagonism, in some instances, which is directly opposed to the interests of the company; and which therefore demands the attention of railroad officers.

Another illustration of a similar character is when, in one case the train is opened 20 minutes or more before leaving time, and passengers who are at the station early can get seated in the train and so be out of the way, so that there is room for later comers to get through the gates, etc. As a result, the majority of the passengers start on their journey in a good humor and pleased with the road. On the other hand, if the train is late in backing into the station, there is a dense crowd about the gate, people become tired of standing or waiting, and when the train is finally announced as ready they crowd through the gates, are pushed and jostled, and the majority start on their journey more or less angry and heated, and disposed to abuse the management and to travel by some other route the next time if possible.

When the time comes when every passenger will be satisfied with the treatment he receives, and every employé will be always courteous and obliging, the millennium will be not far distant. But while we are not expecting a near approach to this condition of affairs at present, we doubt if the operating department realizes, in several instances which we have in mind, to what extent slight neglect on their part is handicapping the passenger department. Neither the disease of which we are speaking nor the remedy is new, but we cannot too often repeat the statement that courtesy as an investment pays.

Trusting the Engineman.

Concerning a topic which was discussed in our issue of Aug. 19 and also on May 20, we have received the following from a General Manager of a Western road:

> In regard to the decision made by Major Marindin, "that the only sure way to make an engineman run slowly at a certain point is to compel him regularly to stop at that point," I do not think good results would follow from this practice; it would seriously interfere with getting trains over the road with promptness. On some roads at certain seasons of the year it is neccessary to slacken the speed of trains at several places, and if it were imperative to come to a stop at these points, serious delays would be the result; also more expense would be incurred in operating the trains, as starting from a dead stop incurs more expense than when the train is in motion at a reduced speed. I think also that it is a reflection upon the engineers, implying a lack of confidence in their obeying the rules of the company. Everything is tending to a higher order of intelligence in railroad engine and trainmen, and nothing should be inaugurated which would have an opposite tendency, which, I think, rules not imperatively required would do. The safety of a road depends largely upon its employés, and it is the duty of the superintendent to see that rules are obeyed, without resorting to measures that are not required. In view, however, of the particular case upon which Major Marindin's observations were made, I think public safety warranted the most stringent measures for protection, and the suggestion seems to me to be most timely and well taken, with reference to those particular conditions and location.

Practically, this manager agrees with Major Marindin, for the Major himself probably has to admit in some cases that his strict rule should be suspended. Both he and our correspondent hold, in substance, that some places are so dangerous that trains ought to be stopped before approaching them and that at others, less dangerous, the runner may be trusted to use his own judgment. On this point the correspondent, whose views we printed Aug. 19 makes, we think, a sufficient answer. But the paragraph which we to-day quote is of interest in connection with another phase of the question, that concerning the improvement in the intelligence of enginemen.

What is said touching this point is virtually a plea for the recognition of the old moral maxim, that to make a man trustworthy you must first trust him. Without going into all the collateral questions suggested by that theory we may call attention to the fact that a great many time-tables, and manuals—even those on good roads which have adopted the standard code—still contain rules which no officer expects will be exactly obeyed. To keep such rules in effect is, in the language of our correspondent, resorting to measures which are not imperatively required, and which imply a lack of confidence in the intelligence of the men. Many managers keep these venerable rules alive because they fear the disturbance to other rules which would be occasioned by taking out these. As we have often said, we believe it the duty of managers in such cases to at once revise their whole code, if need be, rather than tolerate any mere filling or dead matter in the rules; but to those who do not agree with us on that point we would suggest a trial of the theory of a certain bright Pennsylvania superintendent, who says there are too many rules already. He has one unwritten rule which he claims covers all deficiencies in the printed code, and that is one for himself alone. It is to ask the employé in every case of alleged misconduct, Did you use the best judgment that could reasonably be required of a man in

your place in the emergency under consideration? A satisfactory answer to this question is, of course, all that any superintendent can ask for. This theory implies that the men have been well trained, and if it is a true theory it implies that they can be trained better by example and oral precept alone than by the aid of the printed page. We will not discuss this last point just now; but whatever method of training is employed, there is no excuse for the existence of rules which cannot be obeyed or to which obedience is not desired.

The Ocean Transportation of Petroleum.

The petroleum shippers have been able to compel European as well as American railroads to grant them very favorable rates. Bremen had a great trade in this article, which had to be distributed by rail, and the German railroads insisted on getting such remunerative rates as the traffic could easily bear if there were no other way of carrying it. But Hamburg also imported largely and was able to ship a great deal of its product up the Elbe; and from Antwerp to Rotterdam the oil was carried up the Rhine at very low rates. The situation became so threatening at Bremen that the leading importers there, Riedemann & Schütte, in 1886 made all their preparations to remove their business to Rotterdam, going so far as to contract for storage grounds there and at several places up the Rhine; when the management of the Prussian State Railroads granted great reductions in the rates on shipments from Bremen, to prevent the loss of that great traffic. This enabled the firm to continue its business in Bremen, where its members now act as managers of the "German American Petroleum Company," which is the German branch of the Standard Oil Co., which now owns 15 tank steamers with an aggregate capacity of 53,975 tons, for transporting oil across the Atlantic, five lighters, 43 tanks, with 70,650 tons aggregate capacity, sheds to hold 240,000 barrels, and a great cooper shop which can turn out 750,000 barrels a year, besides storage tanks in several interior German cities, and a number of tank boats which navigate the Rhine and the Elbe, and 247 tank cars. The Standard Oil Co. has four European organizations, the Anglo-American Oil Co., for Great Britain; the American Petroleum Co., of Rotterdam, for Belgium and Holland; "la Societá Italo-Americana pel Petrolio," for Italy and Southern Switzerland, and "det Danske Petroleums Aktieselkab," for Scandinavian countries.

The firm of Riedemann & Schütte took a leading part in the improvements in the transportation of petroleum by sea. Formerly it all went from America in sailing vessels, and very likely most of us suppose it is so carried still. But a revolution has been effected since 1886, for the first idea of which perhaps we are indebted to the Russians. When the Caspian oil wells near Baku began to be worked on a large scale, the shippers could get no wood for barrels without bringing it great distances. About 1880 Ludwig Nobel, who was the chief oil producer, had small steamers, with tanks, built to carry oil on the Caspian Sea to the Volga, which then was the chief outlet for it. By 1880 there were about 50 such vessels, making comparatively short trips on comparatively calm waters. Such vessels as those would have been unseaworthy on the Mediterranean, not to say the Atlantic. But Riedemann & Schütte determined to try to adapt the tank system to the trans-Atlantic voyage. An old sailing vessel, the Adromeda, was fitted with 70 boiler-like tanks connected with each other by pipes, so that oil could be pumped from one into the other, and some were left empty, to provide for the expansion of the oil. With these it could carry 2,000 tons or 13,400 barrels of oil. It was hard to get a crew for the craft, and the insurers would place but a very small insurance on it; but it made several voyages safely, beginning in the latter part of 1886, till it finally stranded on the English coast, and was so successful that its owners then determined to make all their imports in tank ships, and in steamers instead of sailing vessels. Their first tank steamer, of 2,720 tons capacity, was built at Newcastle, and this was followed by other larger ones up to 4,500 tons, or 30,000 barrels.

The new method was looked on with disfavor, not only by the harbor workmen, who saw the labor of loading and unloading done by steam pumps, instead of men, but by the Standard Oil Company, which feared it might have to close its great cooper shops. The Knights of Labor threatened to boycott all vessels, sail or steam, chartered by houses which acted for the tank steamers; but by the help of the police several cargoes were loaded, and now by far the larger part of all petroleum imported into Europe is carried by tank steamers.

Formerly the sailing vessels employed in this business (because there was too great risk of fire with a load of petroleum on a steamer) carried usually 7,000 to 10,000 barrels; exceptionally as much as 14,000 barrels. They required about 45 days for the outward voyage to Bremen, 35 days for the return and two months for loading and unloading. A vessel would make 2½ to 3 trips a year, and in the most favorable case deliver 40,000 barrels in that time. The steamer, on the other hand, makes the voyage in 17 days and requires only five days for loading or unloading, and so makes a round trip in 44 days. It makes seven trips yearly and one of 4,500 tons capacity delivers 210,000 barrels in a year.

The steamers are not fitted like the pioneer "Andromeda." The ship's sides, which are most carefully riveted, form part of the walls of the tanks, the hold being divided by perpendicular walls into several compartments, one of which serves for the crew's quarters, and another for ship's stores, and a considerable space aft for the engines, kitchen and officers' quarters. The latter part is separated from the tanks by two walls about a yard apart—the "well-room," which is filled with water to keep the heat of the furnaces from the oil. The body of the vessel is divided by a central partition and seven cross walls, extending from the keel up to the water line, into 14 tanks for holding the oil. It is decked at the water line with a manhole, closing air-tight over each tank. Above this tank deck and the true deck of the vessel the coal is kept in two longitudinal compartments, each extending inward from the ship's side for one-fourth of its breadth. The central space between decks between the two coal bunkers is not filled, but divided into several compartments and serves as a "safety tank," which receives the overflow of the oil when it expands. The division into compartments, required with a fluid cargo to prevent shifting, also serves for safety in case of accident. There has been a case where the ship's side was penetrated, so that the contents of one tank flowed out; but by pumping out the corresponding tank on the other side the ship was able to finish its voyage.

A history of the introduction of these tank steamers and an interesting account of the petroleum plant at Bremen and the method of using it is given in a lecture delivered last March before the Society of Engineers and Architects in Hanover, by R. Thomé, an officer of high rank in the Prussian State Railroad service, which is published in the July-August number of the *Archiv für Eisenbahnwesen*.

The Railroads and the Cholera.

While all the proper and necessary precautions are doubtless being taken by the officers of the principal railroads to provide cleanly conditions in their cars and stations, and to refuse transportation to filthy or suspicious passengers, the principal feature of the cholera news of the past week has been the subsidence of the "scare" headlines. The action of the health boards and the physicians' associations of Philadelphia, Pittsburgh, Cincinnati and other cities, has doubtless been no more than was demanded by the circumstances, but the manner in which they conducted their proceedings, and the way in which these were reported in newspapers, led many to suppose that these and other important cities were to be almost absolutely fenced in. The reports about the establishment of inspecting stations were made to give the impression that every passenger train from New York was likely to be stopped and the passengers unloaded at almost any point where there happened to be a vigilant medical inspector. At Philadelphia the suggestions of the health officer were so radical—even going so far, it is reported, as to include a complete quarantine against New York City—that the newspapers came out with vigorous editorials, which seem to have squelched the doctor's excessive zeal. The discussion at a convention of health officers from various parts of the State of Pennsylvania was magnified into a report that 39 quarantine stations, to guard the 39 most dangerous railroad entrances to the state, were to be established at the state lines at once. There seems to be less alarm in New York City than anywhere else.

The facts we gather are as follows: A train load of emigrants on the Baltimore & Ohio was stopped one day before being allowed to enter Pittsburgh. A few Syrians were stopped at Cape Charles, Va., on account of the Norfolk quarantine. The Mayor of Indianapolis ordered all trains from New York to be stopped at the city limits and examined by a medical inspector. Cincinnati issued a quarantine against rags from foreign ports. Roads leading west from Quebec refused to transport certain emigrants because they believed it would be impossible to carry them into the United States. The Montreal Health Board placed an inspector at Rouse's Point. Toronto appointed sanitary inspectors to examine all trains and vessels bringing passengers from New York. The Canadian Pacific announced that it would take no emigrants. Nothing has been said about the other trunk lines, but there are few emigrants offering themselves.

The Illinois State Board of Health has established a state refuge camp with 500 tents near the state line on the Indiana side, easily accessible to all the railroads entering Chicago. It is planned to have inspectors board all incoming trains bringing emigrants 100 miles east of the state line, and if any diseased persons are found on board to send the entire train to the refuge camp, where it will be isolated and a quarantine of seven days enforced. No quarantine will be established at Chicago against New York, but the railroads are actively co-operating with the health officials in carrying out the rules adopted by the state boards last week. There has been some discussion as to the practicability and advisability of transferring all emigrants not destined to Chicago to the Belt line and sending them on their way to their destinations without permitting them to enter the city. The General Managers' Association at Chicago has adopted resolutions pledging full support and co-operations to whatever rules and regulations the health officers may deem necessary and desirable to be observed.

The Pacific Mail Steamship Co. has made a vigorous protest against the quarantine of the Colombian Government at Colon. The Panama Railroad has taken similar action.

The Louisville & Nashville recently delivered at New Orleans a car load of cotton from the new compress at Montgomery, which was loaded with 120 bales, averaging 540 lbs. each. The car was not full and could easily have held 10 bales more, but it contained 4,800 lbs. more than its marked capacity, as it was. It was a furniture car. Furniture cars and such-like vehicles of large capacity in cubic feet but of small power to sustain weight need to be closely watched nowadays lest they be overloaded. The number of cars in service which can be safely loaded with 30 or 35 tons is now so large that those freight agents who carelessly allow excessive loads to be put into cars need to be warned with renewed care. The capacity marks on old cars should be carefully watched to see that they do not become effaced or faded. It is not safe to assume that, because a car is very big, every one will know that it is not made to be filled full of heavy goods, for furniture cars are now everywhere made to carry 60,000 pounds, and agents will get into the habit of putting heavy loads into them. A really solid substance, like glass, may be packed into a furniture car up to the very roof, provided it is in the shape of lamp chimneys; but with light and fluffy stuff like cotton the loader must be on his guard against overloading, unless the Southerners can be made to use less powerful presses.

The Agricultural Council of the German Empire has passed unanimously resolutions directed to the Chancellor of the Empire, expressing the desire that commercial treaties with other countries should fix for the term of the treaties the rates on railroads and the great water routes. The German farmers complain that the import duties on farm products sometimes are more than balanced by reductions in the transportation charges on such produce, made by the exporting country. The recent commercial treaties have provided that Germans shall have the same freight rates as the citizens of the countries with which the treaties are made, and that there shall be no secret rebates. This, the farmers say, may be advantageous to German manufacturers who export largely, but not to German farmers, because Germany exports scarcely any agricultural produce, and imports a great deal. They ask that the treaties provide particularly that transportation rates on such imports be not *reduced* during the terms of the treaties. As the countries exporting produce (Austria-Hungary particularly) would have something to say on the subject, it is not probable that the wishes of the German farmers will be fulfilled. Imagine a German commercial treaty with the United States in which we should agree that the transportation of wheat from Kansas City and Detroit to the sea should not be less than 5c cents per 100 lbs.

The New York *Evening Post* publishes what it calls a "picturesque story of a new trans-continental line with English capital." In brief, it is that Mr. William Dallin, of Chicago, Vice-President and General Manager of the Atlantic & Pacific Construction Co., relates that it is the purpose of his company to build an air line railroad between New York and San Francisco which will shorten the distance about 800 miles. Unfortunately we are not told what this line is, but we trust that the able engineers who have laid it out have not ignored the elementary fact that if they want to get an air line from New York to San Francisco they must not go due east and west, or stick to a zone between the 38th and the 41st parallels of latitude, but that they must endeavor to follow a great circle of the earth, which will carry them considerably to the north of that zone, through the great lakes, and a good way from the existing centres of trade. Probably this has been thought of. At any rate, Mr. Dallin proposes to go within a few miles of Chicago and within 14 miles of Cleveland, but not to turn out in order to reach these hamlets. As he picturesquely says "the cities will come to us." Other high novelties are introduced. For instance, it is said that "when we come to a river we will bridge it." But for that definite statement one might have supposed that he would go around it, or ford it or tunnel under it. He also says that "if we cannot go over a mountain, we will bore through it, no matter how long it may be." But, suppose he strikes a mountain end on, then what will he do with his air line? Considering the heroic nature of the engineering, the estimate of $700,000,000 for the whole railroad seems to be small, and the time for its completion, namely, in the year 1900, is short, but "English capital" can do a great deal, and doubtless there is plenty of money where this $700,000,000 is to come from. Mr. Dallin descends twice to particulars, at least. He figures that a dividend of five per cent. a year will be declared, and says that a plant costing $2,000,000 will be built at Benton Harbor, Mich., "where the company will build engines, freight and passenger coaches, make rails and, in fact, build everything used in the construction and operation of the road." We regret that there is no description of the freight coaches, but we admit that we are somewhat exacting.

NEW PUBLICATIONS.

Mineral Resources of the United States, Calendar Years 1889 and 1890. David T. Day, Chief of Division of Mining Statistics and Technology, United States Geological Survey. Washington: Government Printing Office, 1892.

In this volume Mr. James M. Swank writes the chapter on iron and steel; Mr. William Kent that on gold and silver; Mr. Charles Kirchoff on copper, lead, zinc and perhaps other minerals. The chapter on coal, the longest and perhaps the most important of all, is by Mr. E. W. Parker; and Mr. Joseph D. Weeks writes on petroleum, natural gas and several other products. Naturally, these specialists, some of whom are distinguished in their specialties, have collected some valuable statistics, and some that are curious if not valuable. For instance, it is interesting to see the changes in the value of coal displaced by natural gas. The values in dollars for the years from 1885 to 1890 are given in the little table below:

1885	$4,857,200	1888	$22,629,875
1886	10,017,000	1889	20,932,059
1887	15,817,500	1890	18,667,725

The top of the wave was reached in 1888, and the return to the use of coal is indicated by the rapid decline in the two years which follow. But it is useless to attempt to select statistics from the volume, many of which have been before our readers long before this, for, generally, those which are given in the report include only 1890, although Mr. Swank gives some figures for 1891.

Transactions of the American Institute of Mining Engineers; Volume XX. June, 1891, to October, 1891, inclusive.

The stout, handsomely printed and well indexed volumes of the Institute are so well-known that it is hardly necessary to do more than to call attention to their issue as they appear from time to time. With this volume appears a general index for Vols. XVI. to XX., inclusive, supplementing the index to Vols. I. to XV., which was published separately a year or two ago. The volumes of the *Transactions*, which are now 20, are sold at $2, $3 and $5 each, according to circumstances, except that Vol. XX., the supply of which on hand is small, is sold at $10. The index to Vols. I. to XV., inclusive, is sold at $1, and papers are sold singly at various prices from six cents upward. Information concerning all of these matters can be had from Dr. R. W. Raymond, Secretary, P. O. Box 23, New York City.

TRADE CATALOGUES.

Air Compressor, Rock Drills, etc., etc. Catalogue No. 7 of the Clayton Air Compressor Works; 43 Dey street, New York City.

The well known Clayton Air Compressors are described and well illustrated in this catalogue, and information as to the size, revolutions, capacities, etc., of the compressors is tabulated in a convenient shape. The special and peculiar parts of the Clayton compressor are also illustrated and described with some minuteness. Besides compressors, the catalogue shows rock drills, a pneumatic mining locomotive and other allied machines. The publishers say: "We do not claim to compete in price with makers of inferior machines, but we do claim that our air compressors will give a cubic foot of compressed air at a lower first cost and less running expense than any other." The company has done a bright thing in invading the field of advertising, and the catalogue contains 21 pages of the advertisements of other houses, which we consider an unwarranted intrusion upon the province of the technical journal.

TECHNICAL.

New Ferryboat for the Southern Pacific.

A ferryboat for the transfer service of the Southern Pacific, between Algiers and New Orleans, has recently been built at Newburgh, N. Y. It was delivered to the company in New York and towed to Algiers by one of the company's steamships. The tracks on the deck are 293 ft. long and the car capacity, 16. The upper works, engine, boiler, etc., will be supplied from the shops of the Southern Pacific company at Algiers. There will be a passenger cabin the full length of the boat on each side. She is a double-end paddle-wheel boat, with horizontal engines 7 ft. stroke and 30 in. diameter of cylinders. The length of transfer is a little over a mile.

Testing Rack of the Boyden Brake Company.

The Boyden Brake Co. has recently erected at its factory, in Baltimore, a testing rack on which are arranged 50 Westinghouse brakes and 50 Boyden. This rack is equipped with the fixtures necessary to make the M. C. B. tests, and in addition has a novel chronograph which registers the different actions of the brake by tenths of seconds. We hope to be able to give illustrations and a description of this rack soon.

The works of the Boyden Brake Co., of Baltimore, Md., are now working on an order for 1,000 brakes. Three patents for triple valves have recently been granted to the Boyden company.

The Baltimore Tunnel.

Standard cross sections and other illustrations of the Baltimore Belt Railroad tunnel were shown in the *Railroad Gazette* of Aug. 5. Since that description was prepared it has been decided to put in an invert for all parts of the tunnel except where the arch stands on solid rock. This decision was made under the advice of Mr. W. T. Manning, who is now Chief Engineer in charge of the construction. The invert will be used for about a mile (the tunnel being 1⅝ miles long), and will be 2½ ft. thick in the centre. There has been much trouble from water and soft ground during the construction, which culminated finally in the ruin of the City College. Besides the collapse of this building, about 100 ft. of the completed masonry of the tunnel settled several inches, causing serious cracks. This part of the masonry has been torn down, and is now rebuilding. The adoption of an inverted arch was considered by Mr. Samuel Rea, who was the first Chief Engineer of the work, when the plans were prepared. Preliminary examinations led to the conclusion that an invert would be necessary in some places, if not throughout the whole tunnel, and accordingly the plans finally adopted for the Howard street tunnel contemplated the use of an invert whenever the same would be required, which could only be determined by the chief engineer as the work progressed.

Electric Lighting of Shops.

The Minneapolis, St. Paul & Sault Ste. Marie shops in Minneapolis are to be lighted by electricity. The contract for installing the plant has been awarded to Messrs. Barnett & Record, of Minneapolis. Power will be furnished by a Ball & Wood engine and the Consolidated Electric Company's system will be employed. Arc lights are to be used in the yard and roundhouse and incandescent lights in the offices and shop. The plant will cost a little over $5,000.

THE SCRAP HEAP.

Notes.

Some of the telegraph operators on the New York, Pennsylvania & Ohio have had their pay increased $5 a month.

The collieries of the Philadelphia & Reading have been ordered to work five days a week, instead of three or four as hitherto.

The Brotherhood of Locomotive Firemen has just held its annual meeting at Cincinnati, and reports a total membership of 25,967.

The Kingston (Ont.) Locomotive Works repudiate the statement that the locomotive which recently exploded at Stellarton, N. S., killing four men, was built at their works.

A Montreal dispatch says that the Canadian Pacific has discharged two ticket agents and suspended two others for cutting passenger rates contrary to the rules of the company.

Fred. Horton has been sentenced to imprisonment for life in Georgia for setting fire to trestle bridges on the Central of Georgia several months ago. His brother received a similar sentence some time ago.

It is given out at the Philadelphia & Reading shops in Pottsville, Penn., that the company has decided to paint all its main and leased line freight, gondola, and coal cars black, with white lettering, in the same style that Lehigh Valley cars are painted.

On Sept. 19 the brakemen of the Kansas & Arkansas Valley Division of the St. Louis, Iron Mountain & Southern struck, in consequence of an order that the number of brakemen to a train should be two instead of three. The following day it was reported that the company had agreed to continue the old plan.

Charles H. Strain, an engineer on the Pittsburg, McKeesport & Youghiogheny has been sentenced to pay a fine of $100 and to 48 hours in jail for forgetting a train order, causing a collision which resulted in the death of a fireman. The crime was decided to be a "misdemeanor."

The report published all over the country on Sept. 15, to the effect that the Pennsylvania Company had discharged four telegraph operators at Toledo for refusing to renounce their allegiance to the order of railway telegraphers, is pronounced by the officers of the road unfounded.

The elevator companies in Minneapolis have decided to withhold reports of stocks of grain on hand from *Bradstreet's* and other commercial periodicals. The manager of one of the companies is reported as saying; "It is the only line of business I know of where people who have goods to sell practically depreciate the same saying to their buyers: 'Hold off and you can get our property cheaper than you can if you buy now.'"

The false work of the Superior Belt Line & Terminal bridge across the St. Louis River at New Duluth, Minn., was struck by a tugboat on Sept. 14, and the entire span fell into the river. This accident will delay the completion of the bridge about three weeks, and the damage will amount to $10,000. Mr. Hudson, foreman for the King Bridge Co., received injuries which may prove fatal, and three other men were more or less seriously injured.

The order to the ticket agents of the Erie forbidding them to issue any employés' 500-mile books at $2.50 after Sept. 10, was revoked on that day and the books will be issued the same as before. The order was issued on the 5th, and between that and the 10th the agents were kept busy making out new books. Many of the men who had never before bought any of the books invested, fearing that they would have to pay two cents a mile. The result is enough books have been sold to cut off the demand for some months to come.—*Buffalo paper.*

Foreign Notes.

A new mountain railroad system is described in a recent issue of the *Zeitschrift* of the Verein Deutscher Eisenbahn-Verwaltungen. In this the usual rack is to be dispensed with, and a cable, fixed at both ends is to be used. This cable takes several turns around a drum, mounted on the locomotive and having the same diameter as the locomotive driving wheels. With every revolution of the drum, therefore, a length of cable equal to the circumference of one of the drivers is wound up and unwound, corresponding to an equivalent length of travel of the locomotive. The drum is but slightly raised above the plane of the cable, and the latter, therefore, is lifted only a small amount. At curves a special arrangement is adopted for guiding the cable, but of this no particulars are given. It is stated that with a working model a grade of 33 per cent. was mounted while, at the same time, passing a sharp curve.

Concerning the much spoken of Siberian railroads we find it stated in one of the German papers that work has recently been commenced on the 747 verst section beginning at Tscheljabinsk, which latter place lies within the limits of Eurepean Russia. The line will pass through Kurgan and Tomsk. There are to be stations only at intervals of 50 versts (one verst = 1,167 yards). At the eastern end of the road, reckoning from Vladivostok, the eastern terminus, about 400 versts are under construction. From Omsk to the river Tom, at a point about 80 versts south of Tomsk, something like 750 versts of road have been taken in hand. At present, therefore, work on about a third of the whole length (6,300 versts) is at least begun.

World's Fair Notes.

Preparations for the dedicatory exercises are still being made. It is now said that seats for 125,000 people will be provided in the Manufacturers' Building.

The Board of Control has taken steps toward the appointment of judges of awards, and has appropriated $10,000 for the preliminary work in this direction.

The Executive Committee of the Engineering Congress has made application through its Chairman, Mr. E. L. Corthell, for 1,200 sq. ft. of space in the Transportation building.

The Edgemoor Bridge Works will include in their exhibit sections of various bridges, viaducts, etc., and large photographs of important bridges designed and erected by them.

The King Bridge Co., of Cleveland, and the Union Bridge Co., of New York, have asked for wall space for the display of large photographs of bridges in the Department of Transportation.

The amount of space which will be devoted to the department of Liberal Arts appears to be still under discussion. Another building has been frequently asked for and as frequently refused. The space in the Manufacturers' Building has been cut down, and it has been suggested that space for this department should be provided in the Woman's Building. At last accounts the space for Education and Liberal Arts was reduced from 400,000 to 250,000 sq. ft., and that for ethnological exhibit from 160,000 to 60,000 sq. ft.

Steel Rail Contract.

The Department of Railways and Canals is calling for tenders for the supply of 4,100 tons of steel rails for the Intercolonial and Prince Edward Island roads. Three thousand tons are to be delivered at St. John, 300 at Halifax and 800 tons at Summerside, P. E. I. Tenders will be received up to Oct. 25.

Life in the Fresno Mountains.

The killing of two more officers by the fugitive train robbers in Fresno County has excited great indignation in that county as well as throughout the state. The scene of the crime was Simpson's Flat, a notorious rendezvous in early days for cattle thieves and other desperate characters. The men who live in the Fresno mountains are not all lawless, but they have curious notions of property rights, and they are so bitterly hostile to the Southern Pacific that they will furnish no help to run down any one who robs the railroad or Wells-Fargo Express Co. These two blood-stained desperadoes, Evans and Sontag, have been shielded from capture by miners and sheep herders, and in return they ambush and murder two officers of a sheriff's posse that was pursuing them. The fugitives will now be shot on sight, as the railroad and express companies will pay a reward of $10,000 for the bodies, dead or alive.—*San Francisco Correspondent New York Tribune.*

Railroads in Palestine.

Railroads in Palestine will be so common soon that no notice will be taken of them. A new line has been begun, starting from the old castle at Acre, passing north of Mount Carmel, across the plains of Esdrelon—with a station at Nazareth—and crossing the Jordan near Bethsham. Thence it will proceed with an easy gradient to Damascus. Already the Jaffa railroad is working transformations. "Villas" are springing up at Jerusalem along the Jaffa road. A large hotel has been built near the Armenian convent, and the station for Rethlehem, predicted two generations ago by the author of "Eothen," is actually in hand. As if to emphasize the substitution of the modern for the ancient spirit it is now announced that the quarrymen of Jerusalem have gone on strike. Whether the walking delegate is known in that remote region the dispatch does not say. Just as soon as the march of improvements created a demand for more stone the quarrymen demanded more pay, which the contractors and builders refused to grant. Thereupon the stone workers "went out" in regular western fashion.

Serious Train Accident in Portugal.

A passenger train was wrecked Sept. 16 about 30 miles from Torres Novas. Nine were killed and eight were injured severely. The cause of the accident was a loose rail.

An Electric Carriage in Chicago.

The *Western Electrician* has recently published a description, with illustrations from photographs, of an electric carriage operated by storage batteries, which is now being experimented with in Chicago. This carriage has three seats and a canopy top, the storage battery being placed under the seats. The motor is of 2½ horse power, and is connected by a train of gearing to the right-hand back wheel of the carriage. The controlling apparatus consists of a contact board and reversing switch, both fastened to the under side of the carriage floor. The connections are such that the batteries can be used in various combinations of series and parallel. On a recent trip in the city with six men in the carriage the current used was found to vary from 25 to 75 amperes, the electromotive force of the batteries being 48 volts. This gives a range of about 1.6 to 4.8 horse power. The mean horse power would apparently be not far from two and one-quarter.

The Chicago & St. Louis Electric Railroad Co.

This company has recently issued a prospectus from which we abstract the following, omitting the italics: The company has acquired the exclusive right to operate such a road between Chicago and St. Louis under valuable and necessary patents. It has made its surveys and established the permanent location of the road, and has acquired a large percentage of the right of way and is rapidly acquiring the remainder. It has secured valuable terminal facilities in St. Louis and Chicago. It owns the finest equipped brick and tile making plant in Illinois. It has already commeneed the construction of its motors. It will be a double track, stone ballasted road, built on a straight line between the two cities, and will be 38 miles shorter than the shortest existing steam road. There are to be no railroad or wagon road crossings at grade. The trip will be made between Chicago and St. Louis in three hours. It will neither adopt nor use anything experimental in its equipment. It does not possess a single working feature in connection with the entire system that has not been subjected to the most searching scrutiny by the most competent electrical and engineering talent of America and Europe. The passenger, express and mail business which will necessarily be diverted to it, figured on a most conservative basis, will enable the company operating it to pay dividends on its capital stock of from 12 to 15 per cent. Its electric light and power distributing business will certainly add from 8 to 10 per cent. to this amount.

The through passenger business between Chicago and St. Louis at the present time averages 1,200 passengers per day. The through mail contracts amount to $210,000 per year, and the through express business amounts to over $500,000 per year. The business from these several sources will certainly be trebled on the completion of this road by reason of the passenger, express and mail which will certainly be diverted from other channels. This road will virtually control the bulk of the passenger and mail business between the East and the West.

The capital stock is stated to be $7,000,000. The estimated yearly revenue from passenger business is $1,035,000; mail $300,000, express, $500,000; light and power distribution, $1,000,000. The estimated expenses are $450,000 for operating expenses and depreciation of plant, $420,000 interest on $7,000,000 of bonds, leaving the net earnings $2,025,000, equivalent to 25 per cent. on the capital stock.

This prospectus is signed by F. E. Nipher, President, and Wellington Adams, Secretary and General Manager, and the names of a number of well known gentlemen residing in St. Louis are appended as being interested in the project. It is hardly necessary to add that all of the above statements are made on the authority of the prospectus, and that the *Railroad Gazette* is not to be held responsible for any of them.

Young Men's Christian Association Building at West Philadelphia.

The "Pennsylvania Railroad Men's News," of Philadelphia, prints a picture and prospectus of a building which it is proposed to erect for the use of railroad men at Forty-first street and Westminster avenue, West Philadelphia, close to the Fortieth street station. This location is easy of access from the railroad yards and the building will front on a fine street in a handsome residence section of the city. The plans are evidently for an elegant building, equal, perhaps, to the Vanderbilt building in New York City, and considerably larger than that. The Young Men's Christian Association, of Philadelphia, has subscribed $5,000 and committees are now taking subscriptions among railroad men. It is understood that the Pennsylvania Railroad Company will, on the completion of these subscriptions, contribute whatever may be necessary to make up the required amount. The prospectus states that there are 10,000 Pennsylvania railroad men in Philadelphia and West Philadelphia. The proposed building will be of gray stone with tiled brick trimmings. It will be 70x115 feet, and will contain gymnasium, baths, large reception room, and a hall with 825 seats on the first floor; on the second floor there will be a lecture room, parlor, kitchen and two class-rooms, and the top floor will contain sleeping-rooms and class-rooms.

A 60,000 lb. Car is No-where.

The new twin-screw steamer "Bovic," of the White Star line, sailed from New York Sept. 12 on her first outward voyage, with what is said to be the biggest cargo ever taken from New York, and with the greatest number of bales of cotton ever carried in a ship. Besides 700 cattle on deck, she had 8,093 bales of cotton, 9,400 sacks of flour, 16,000 bushels of grain, 1,650 packages of lard, 979 boxes of bacon, 63 tierces of beef, 1,104 barrels of cottonseed oil, 60 barrels of paraffine wax, 300 tons of cottonseed cake, 100 tons of copper ore, 100 tons of acetate of lime, 190 packages of candles, and one refrigerator containing 1,600 quarters of beef.

The Labrador Railroad.

A Canadian correspondent writes as follows: "To the ordinary mortal it would seem absurd to build a railroad through the wilderness of Labrador, but, as one of our papers remarks, 'railways are the politics of this country.' 'Payability' is only one of the factors that decide their existence. At any rate an English engineer, Mr. Alfred Palmer, has been engaged to survey a route for the proposed line, and his report has just been issued. From an engineering point of view he looks upon it as quite practicable. He suggests that the line should run from Chicoutimi, on the Saguenay, northeast of Quebec, and where the Quebec & Lake St. John Railroad has already penetrated, to the Bay of Islands on the Gulf of St. Lawrence. Thence it would run for 200 miles along the shore to Port Marnham, 60 miles from Belleisle Straits, on the Atlantic coast. From this terminus a fast steamer would carry mails to Liverpool in about three days, and the hope of the promoters is that the shortness of the sea journey would commend this route to passengers also. Unfortunately, it is only the first half of the sea journey that the passengers object to, and it is only the second half that would be abolished. The country traversed is rich in minerals, and the snow would be less of an obstacle than it is on the south shore of the river and gulf, and Port Marnham is open for seven or eight months. This last opinion is contested by Mr. Joncas, M. P. for Gaspé and an authority on the Gulf region, who believes that six months in the year would be the limit of navigation. Mr. Joncas agrees with Mr. Palmer as to the comparative ease with which a line could be built through Labrador, but warns the Canadians against throwing away 20 or 30 million dollars on such an enterprise. One of the arguments used in favor of the railroad is that it will bring about the entrance of Newfoundland to the Dominion of Canada. The length of the new line would be about 650 miles."

A Memorial to Krupp.

The unveiling of the memorial in honor of Alfred Krupp has just been celebrated at Essen in presence of a great concourse of people, among whom were many officials and workmen of the firm. Herr Frederick Krupp, who, since the death of his father, has carried on the works, had placed in the hands of a committee the sum of 500,000 marks to be devoted to the erection of 100 small dwellings with gardens for the use of the worthiest of the workmen of his factory when infirmity renders it necessary for them to cease work.

A Dinner to Mr. Fritz.

Certain friends of Mr. John Fritz, General Manager of the Bethlehem Iron Co., have arranged a dinner to be given in celebration of his seventieth birthday next Wednesday at Bethlehem, Pa. Those who attend the dinner are invited to visit the Bethlehem works on the following day, where they will have an opportunity to see the magnificent achievements of Mr. Fritz and his associates in building up that great plant of which the committee says, "It is not only the crowning glory of long years and patient, untiring labor on Mr. Fritz's part, but it is as well an example of what has been accomplished by the American engineer in a line of work in which he was the last to engage."

The Soulanges Canal.

Mr. Archibald Stewart, of Ottawa, has been notified by the Dominion government that his tender for work on sections 1 and 2 of the Soulanges canal has been accepted. It is understood that a very low offer has been made. We expect to describe this work in an early issue.

Canadian Imports.

The value of steam engines imported into Canada and Newfoundland from the United States during the seven months ending July 31, was $493,775 against $583,753 during the corresponding months of last year. During the same period the value of manufactures of iron and steel entering Canada and Newfoundland from the United States was $259,828 against $218,406 in 1891. During the seven months the United States sold Canada and Newfoundland 948,159 tons of coal against 814,664 tons in 1891. The value of carriages and horse cars and cars for steam railroads purchased from the United States by the British North American provinces during the same period fell from $79,984 to $53,209.

Serious Wreck at Osage City, Kan.

Eastbound passenger train No. 8 of the Atchison, Topeka & Santa Fe was derailed by a loose rail near Osage City at 3 a. m., Sept. 21, and six cars wrecked. There were about 200 passengers aboard and the wreck was a very bad one, several cars being piled upon the engine; but they did not take fire. The engineer, fireman and two expressmen were killed and 17 passengers and four employés injured. It is said that the bolts and spikes had been withdrawn from two rails, and it is believed that the perpetrators of the crime intended to rob the train, which, the reports say, carried $1,000,000 in currency.

Butting Collision at Shreve, O.; 13 Killed.

Eastbound passenger train No. 8 and westbound freight No. 75 on the Pittsburgh, Fort Wayne & Chicago met on the main track near Shreve, O., about 3 o'clock on the morning of Sept. 21, while running at high speed, and the engines, two baggage, two passenger and several freight cars were wrecked. Fire immediately broke out, and the wrecked cars were burned up. Eight trainmen and postal clerks and five passengers were killed by the collision or by the flames (mostly the latter, it is believed) and seven passengers and one trainman injured. The official report says that the freight conductor and the engineman forgot their orders. A press dispatch says that they were asleep on a side track, and guessed at the number of a passenger train which passed them there.

The Westinghouse Air Brake Co.

The annual meeting of the stockholders of the Westinghouse Air Brake Co. was held at Wilmerding, Pa., last week. The old officers were re-elected, as follows: George Westinghouse, President; Robert Pitcairn, Vice-President; John Caldwell, Treasurer, and W. W. Card, Secretary. All the old directors were re-elected. It is stated that the gross earnings of this concern for the past year appoximate $5,000,000, the expenses being $2,600,000, leaving the net earnings $2,400,000, which shows an increase of about $700,000, and that the company have between $1,000,000 and $1,250,000 cash on hand.

LOCOMOTIVE BUILDING.

The Brooks Locomotive Works, Dunkirk, N. Y., have an order for three locomotives for the Peoria & Pekin Union.

CAR BUILDING.

The Cleveland & Marietta is about placing an order for 300 30-ton coal cars.

The Ensign Car & Mfg. Co. received orders last week for 50 fruit cars and 50 new refrigerator cars.

The Old Colony road has just added to its equipment six new Pullman coaches, which will be used on its Boston and Washington express train.

The Buffalo Car Mfg. Co. is just finishing the last of an order for 100 large furniture cars for the New York Central & Hudson River road, which completes the order for 1,000 cars recently given.

The Norfolk & Western last week received a train of 20 new baggage cars from the Pullman Car Co. They are fitted for use on vestibule trains, which will be run through on that road as soon as the Ohio extension is completed.

BRIDGE BUILDING.

Alton, Ill.—The report published in this column on Sept. 9 that the New Jersey Steel & Iron Co. were the contractors for the superstructure of the new bridge across the Mississippi River at Alton is not correct.

Braxton County, W. Va.—On last Wednesday the County Court of Braxton County spent the entire day considering bridge matters. It was decided to build a new bridge across Elk River at Braxton C. H., also over the Kanawha River at Burnsville. The Clerk of the Court was instructed to employ an engineer to prepare plans and specifications for the two bridges, to be submitted in October. The contract for the bridge recently advertisedt for ove the Little Kanawha was let. Tully & Kelly get the masonry at $7.45 per cu. yd.; $1 per yd. for wet excavation and 45 cents for dry, and $20 per 1,000 ft. for lumber. The Variety Iron Works at Cleveland get the superstructure at $1,813. The bridge will be a steel truss 150 ft. span.

Chester County, Pa.—A new iron bridge is to be erected over Broad Run, in East Bradford township.

Clarksville, Tenn.—W. H. Converse, of Chattanooga, has the contract to build a bridge across the Red River at a cost of about $10,000.

Clinton, Ia.—The bridge across the Mississippi River was opened to the public on the 17th inst. The aggregate length of the spans is 2,814 ft., and that of the approaches 2,180 ft. Work was commenced on Sept. 8, 1890. The roadway is 18 ft. wide and the total weight of the structure is 1,800,000 lbs.

Duluth, Minn.—Another obstacle has been encountered in the matter of the proposed bridge across the ship canal to Minnesota Point. While the lift bridge designed by J. G. L. Waddell would overcome the objection of the Federal authorities, it is now learned that the bill passed by the Minnesota Legislature, authorizing the construction of the bridge, calls for a drawbridge.

Greenville, S. C.—A contract will be let on Oct. 7 by the County Commissioners for the construction of a new bridge over Reedy River, near Greenville.

Louisville, Ky.—The Phœnix Bridge Co. has filed a suit in the United States Court at Louisville against the Louisville & Jeffersonville Bridge Co., and the East End Improvement Co., for $201,336 and interest from May 16, 1891, which sum it is claimed is due them on account for the construction of the proposed bridge across the Ohio River to Jeffersonville, Ind., upo which considerable work was done in 1890.

Medford, Mass.—Proposals for building the outments and retaining walls of Weir bridge between Medford and Arlington were opened last week. County Engineer Charles Mills stated there were 200 cu. yds. of dimension stone, 210 cu. yds. of rubble and 211 cu. yds. of excavating. The proposals were as follows: M. Cashman, Malden, $5,956; Nicholas White, Medford, $3,261; J. H. Leavitt, Boston, $3,161; Trumbull & Ryan, Boston, $4,018; Dean & Westbrook, New York, $3,944; D. Henry Cram, Boston, $4,578. The contract was given to Nicholas White.

Pittsburgh, Pa.—Chief Bigelow, of the Department of Public Works, will in a few days advertise for bids for the building of the proposed Ben Venue iron bridge. The structure will be from 300 to 400 ft. in length and will be similar in appearance to the other iron bridges of the East End. The cost of the bridge will be $65,000, and the appropriation was passed by Councils some time ago.

Point Marion, Pa.—The work of building a new bridge across Cheat River, at Point Marion, Pa., for the new line of the Baltimore & Ohio, from Morgantown, W. Va., is now well under way. A raft of 200,000 ft. of 12 × 12 hemlock has been delivered at the site of the bridge, and a force of 50 men is at work building the caissons for the piers. There will be five piers, and each span of the bridge will be 135 ft. in the clear.

St. Louis.—At request of a number of citizens of North St. Louis, the directors have decided to have surveys made to get an estimate of the cost of adding a wagonway, with space for a street car line, to the Merchants' Terminal Bridge across the Mississippi River. It is thought that from $150,000 to $200,000 will be required.

Seeley, N. J.—The Cumberland County Board of Freeholders have authorized the erection of a new iron bridge at Seely at a cost not to exceed $1,250.

Yorkville, S. C.—A contract will be let on Sept. 21 for building a bridge over Clark's fork, near Yorkville.

Woodstock, N. B.—At the request of the Government of New Brunswick, the provincial government of Nova Scotia has sent Engineer Murphy to Woodstock to advise respecting the erection of a large bridge to cross the St. John River. New Brunswick is following the example of Nova Scotia in renewing their wooden bridges with more permanent structures of stone and iron.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent., on the preferred stock, payable Oct. 2.

Evansville & Terre Haute, semi-annual, 5 per cent., payable Oct. 10.

Lehigh Valley, quarterly, 1½ per cent., payable Oct. 15.

Norfolk & Southern, quarterly, 1 per cent., payable Oct. 10.

Oregon Railway & Navigation Co., quarterly, 1½ per cent., payable Oct. 1.

Rio Grande Western, quarterly, 1¼ per cent., on the preferred stock, payable Nov. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Addison & Pennsylvania, special, New York City, Sept. 26.

Alabama Great Southern, annual, Birmingham, Ala., Oct. 5.

Boston & Albany, annual, Boston, Sept. 28.

Chicago, Detroit & Canada Grand Trunk Junction, annual, Detroit, Sept. 28.

Cincinnati, Lebanon & Northern, annual, Cincinnati, O., Oct. 11.

Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 26.

Colorado Midland, annual, Colorado Springs, Col., Oct. 3.

Denver & Rio Grande, annual, Denver, Col., Oct. 18.

Evansville & Terre Haute, annual, Evansville, Ind., Oct. 17.

Fitchburg, annual, Boston, Sept. 28, to confirm agreement for the consolidation of the Fitchburg with the Boston, Hoosac Tunnel & Western, and the Troy, Saratoga & Northern.

Housatonic, special, Bridgeport, Conn., Oct. 18, to approve of the lease to the New York, New Haven & Hartford.

Illinois Central, annual, Chicago, Ill., Oct. 12, to con-

sider an increase of stock from $45,000,000 to $50,000,000.

Lake Erie & Western, annual, Peoria, Ill., Oct. 5.

Louisville & Nashville, annual, Louisville, Ky., Oct. 5.

Louisville, New Orleans & Texas, special, New Orleans, La., Sept. 30, and annual, Oct. 3, to consider a consolidation with the Yazoo & Mississippi Valley.

Manhattan, annual, New York City, Nov. 9.

Michigan Air Line, annual, Detroit, Sept. 28.

Minneapolis & St. Louis, annual, Minneapolis, Minn., Oct. 4.

New York, New Haven & Hartford, annual, New Haven, Conn., Oct. 19.

New York, Ontario & Western, annual, New York City, Sept. 28.

New York, Pennsylvania & Ohio, annual, Cleveland, O., Oct. 12.

Northern Pacific, annual, Mills Building, New York City, Oct. 20.

Ohio & Mississippi, annual, Cincinnati, O., Oct. 13.

Pittsfield & North Adams, annual, Boston, Sept. 28.

St. Paul & Duluth, annual, St. Paul, Minn., Oct. 13.

Toledo & Ohio Central, special, Toledo, O., Sept. 29, to consider the increase of the stock, the extension of the line and other matters.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its next annual meeting at Lookout Mountain Hotel, Chattanooga, Tenn., Oct. 18, 19 and 20, and at the Kimball House, Atlanta, Ga., Oct. 21 and 22.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November. The next meeting will be held on Wednesday, Sept. 28.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Broomfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

American Society of Civil Engineers.

At the meeting held on the evening of the 7th inst., the first paper read was on "The Increasing Cost of Railway Tie Renewals," by Benjamin Reece, M. Am. Soc. C. E. It was briefly discussed by the President, and has already been considered in the *Gazette*.

The next paper was on

THIN FLOORS FOR BRIDGES,

by Albert F. Robinson, M. Am. Soc. C. E., and it was discussed by Messrs. T. C. Clarke and George S. Morison. Mr. Clarke said that there were two points to be considered—first that of renewal of the floor; the other, that of deadening the noise. A lighter material for ballast of such floors would be an excellent thing. The concrete mentioned, in which coke is used instead of stone, would make too solid a bearing and lack elasticity. Rails directly on the iron would cause too much noise. The New York Central plan of bedding the ties in ballast seemed best. On the Alton Railroad burned clay was used, but it caused much dust. Reference was made also to the track of the Elevated Railroad in Liverpool.

Mr. Morison described the use of such a floor on the city bridge in Omaha to carry 13 tracks over a street, requiring it to be tight. He detailed the difficulties of the location, requiring the lowest possible position of the rails, and the character of the truss and floor. One of the great advantages of such a strong floor was shown in the way in which the bridge withstood a flood which brought great numbers of trees against it.

Written discussions on these papers can be sent in up to Oct. 15.

The mid-month meeting was held on Sept. 21. The first paper read was on

THE STRENGTH AND WEATHERING QUALITIES OF ROOFING SLATES,

by Mansfield Merriman, M. Am. Soc. C. E.

This paper is based on a careful examination of slates from Northampton County, Pennsylvania. Geologically, these deposits belong to the formation called the Hudson River slates. They dip towards the Northwest, and have a thickness of 6,000 feet perpendicular to the dip. The geological structure of the formation is very complicated. The original planes of stratification are usually marked by seams or ribbons, which traverse the rock in approximately parallel directions, and which differ in color and composition from the slates proper. The planes of cleavage are not parallel to these ribbons, but the angles made vary in different quarries. The outcrop near the top of the formation, near the base of the Blue Mountain, produces the soft slates used for roofing and school slates. The outcrop near the bottom of the formation, several miles away, produces the hard slates used for sidewalks and steps. In the upper beds the ribbons are soft and of inferior quality to the slate proper; in the lower beds they are often harder than the slates. The slate deposits are covered with earth and gravel to the depth of from 10 to 50 ft. After removing this and the weathered outcrop, the slate is quarried by drilling holes at right angles to the cleavage planes, and blasting out large blocks, which are broken into smaller blocks about 1 or 2 ft. thick, 2 or 3 ft. wide, and 8 or 10 ft. long. These are removed to shanties, and there split, 1st, into thicknesses of about 2 in. These are subdivided and the parts again divided, the process continuing until the required thickness of about $\frac{1}{16}$ of an inch is reached. The rock splits best when damp. Numerous sizes are made, varying from 6×12 to 14×24 in. In proper roofing, a triple lap of 3 in. is allowed; thus, for a 24-in. slate 10½ in. of each slate are uncovered, 10½ in. are covered by one thickness, and 3 in. by two thicknesses. The amount of slate required to cover a space 10×10 ft. is called a square.

The best slates are called No. 1 stock. Those with one ribbon crossing them are No. 1 Rib, and those with two ribbons No. 2 Rib. The slates from the Albion quarries at Pen Argyle, and from Bangor (here investigated) are of dark bluish gray. On exposure to the weather, the ribbons effloresce and show signs of decomposition, due to the sulphide of iron contained. Such slates should not be allowed on permanent work.

The tests detailed in the paper were made for strength, hardness and porosity. The pieces tested were 12×24×$\frac{1}{16}$ to ¼ in., and were all free from ribbons, 12 being taken from each of the quarries mentioned. The slates from the Bangor quarry were somewhat more even in surface and slightly darker. In testing, the slates were supported on wooden knife edges 22 in. apart, and the load was supported by another knife edge midway between. The load was applied by means of sand running from an orifice at the rate of 70 lbs. per minute, and the modulus of rupture S was obtained in pounds per square inch. The slates from the Bangor quarries gave values of 8,100 to 10,235, with a mean value of 9,810. Those from the Albion quarries 7,150 lbs. The ultimate deflection was measured in each case, and gave an indication of the toughness of the specimen, since the greater the deflection the tougher will the specimen be. The deflection of the Albion specimens averaged 0.270 in., and that of the Bangor 0.313 in. The first broke with a squarer rupture, and showed more lamination. The hardness of the slates was tested by abrasion upon a grindstone under a constant pressure, and for a given number of turns. The loss of weight by the Bangor specimens was 60 per cent. more than by the Albion, showing that the latter is best for places where hardness is a requisite, as when it is used for sidewalks. Absorption tests showed 0.238 per cent. of water absorbed in weight by the Albion, and 0.145 by the Bangor, in 24 hours. Tests for corrosion by a 2 per cent. solution of equal parts of nitric and hydrochloric acids in water showed somewhat in favor of the Bangor slates.

The following conclusions were reached for the slates tested:

1. Slates containing soft ribbons are inferior, and should not be used in good work.

2. The soft roofing slates weigh about 173 lbs per cu. ft., and the best qualities have a modulus of rupture of from 7,000 to 10,000 lbs. per sq. in.

3. The stronger the slate, the greater is its toughness and softness, and the less is its porosity and corrodibility.

4. Softness, or liability to abrasion, does not indicate inferior roofing slate, but is an indication of strength and good weathering qualities.

5. The strongest slate stands the weather best, so that a flexural test affords an excellent index of all its properties.

6. The strongest and best slate has the highest percentage of silicates of iron and aluminum, but is not necessarily the lowest in carbonates of lime and magnesia.

7. Chemical analyses give only imperfect conclusions regarding either durability or physical properties.

8. Flexural tests should be required by specification.

9. It is suggested that specifications should require roofing slates to have a modulus of rupture, by flexure, of greater than 7,000 pounds per square inch.

The second paper of the evening was on "Tests of Power Required to Drive Electric Street Cars and Total Efficiency of the Motor," by Louis B. Bonnett, Jun. Am. Soc. C. E. The last paper was on "Motive Power for Street Railways," by Alfred F. Sears, M. Am. Soc. C. E.

PUBLICATION OF PAPERS.

The Board of Directors, at its meeting on the 6th inst., adopted the rule that "Papers shall, as soon as possible after acceptance by the Publication Committee, be read at a regular meeting of the Society, and shall then be promptly published in the *Transactions* and immediately distributed to the members. The discussions of any paper shall be separately published in a subsequent number of the *Transactions*, as soon as possible after the publication of the paper." By this means it is hoped to place papers more quickly in the hands of members, and enable all who choose to discuss them intelligibly. To this end it will be understood that written discussions may be sent in for a time to be named. This will overcome an objection of some authors as to delay in publication.

International Association of Ticket Agents.

This Association held its annual meeting in Philadelphia last week. The most prominent feature of the gathering was the handsome way in which the three principal railroads and the Board of Trade and other organizations of the city entertained the members, who, with their wives and friends, made a company of over 600. Some of the courtesies tendered by the Pennsylvania have been heretofore mentioned in these columns. The Baltimore & Ohio gave an excursion to Washington, and the Philadelphia & Reading one to Atlantic City, including entertainment at the hotels there. Many of the Western members returned over the Reading to Niagara Falls, by which road they were handsomely entertained.

The officers chosen for the ensuing year were: President, H. E. Day, Florida Central & Peninsula, Gainesville, Fla.; Vice-President, W. B. Conard, Philadelphia & Reading, Philadelphia, Pa.; Second Vice-President, William Lomiller, La Crosse, Wis.; Third Vice-President, J. A. Dart, Michigan Central, Ridgetown, Ont. C. G. Cadwalder, of Philadelphia, was chosen Secretary in place of M. G. Carrell, of Cleveland, who is now out of the railroad service. The Treasurer is T. W. Venemann, Evansville, Ind.

Master Car and Locomotive Painters' Association.

At the annual meeting of this association in Detroit last week the following officers were elected: President, William O. Quest, Pittsburgh; First Vice-President, W. J. Orr, Rochester; Second Vice-President, W. T. Leopold, Savannah; Secretary and Treasurer, Robert McKeon, Kent, O.

New York Railroad Club.

The first regular meeting of this Club for the season of 1892-93 was held Thursday evening, Sept. 15 at 7:30, at the rooms of the American Society of Mechanical Engineers', New York City.

President Blackall was in the chair and made a short address to the club.

By the direction of the President the Secretary read a letter calling the attention of the Club to a plan for having laboratory tests of locomotives made as a part of the transportation exhibit at the World's Fair. A resolution was offered to the effect that the President appoint a committee of three to draft a resolution expressing the sentiments of the Club in this matter. Accordingly, the following resolution was drawn up and adopted:

Resolved: That the New York Railroad Club recognizes the desirability of undertaking a series of laboratory tests of locomotives in connection with the Transportation Exhibit at the World's Columbian Exposition, and that the Club will be glad to aid in and support such tests in any way that is in its power.

Mr. Hugh Baines read a paper on "Rolling Stock and Its Relations to Track," and Mr. F. A. Stinard read a paper on "Boiler Scale and Purification of Feed-Water." There was but very little discussions of these papers.

The Civil Engineers' Club of Cleveland.

The September meeting of the Club was held at the Club Rooms Sept. 13. Willard Fuller was elected an Active Member. Prof. C. H. Benjamin, of Case School of Applied Science, read a paper on "Some Experiments on the Effect of Punching on Soft Steel."

The experiments described were made at the Mechanical Laboratory of Case School of Applied Science under the direction of the writer and had for their objects, first, the determination of the ultimate resistance to shearing of soft steel plate for different forms of punch; second, the determination of the effect of the punching on the elastic limit and ultimate tensile strength of the plate in the various cases. In every test the material used was Otis steel boiler plate one-quarter-inch thick and stamped 60,000-lbs. tensile strength, the pieces all being cut from same plate. The experiments showed that the average resistance to punching with the common forms of punch was 50,000 lbs. per sq. in., while with the spiral punch it was only 38,000 lbs. Also that punching a plate with the ordinary form weakened it 7½ per cent., while the use of the spiral punch only weakened it 3 per cent. A considerable change in clearance affected the results but slightly, but good or bad centring of punch and die was very noticeable in its effects.

Western Railway Club.

At a meeting of the Western Railway Club, Sept. 20, the following officers for the ensuing year were elected: President, W. H. Lewis, Master Mechanic, C. B. & N., La Crosse, Wis., First Vice-President, A. M. Waitt, Assistant General Master Car Builder, L. S. & M. S., Cleveland, Second Vice-President, Wm. Forsyth, Mechanical Engineer, C. B. & Q., Aurora, Ill. The Treasurer, Allen Cooke, Danville, Ill., and the Secretary, W. H. Marshall, Chicago, were re-elected.

PERSONAL.

—Mr. E. Wygant has resigned his position as General Baggage Agent of the Grand Rapids & Indiana road.

—Mr. W. J. McKee, Superintendent of the Memphis and Riverside divisions of the Louisville, New Orleans & Texas, has resigned.

—Mr. Arthur Donnelly, a wealthy railroad contractor of Memphis, Tenn., sustained fatal injuries at Knoxville, Sept. 15, by a fall from a hotel window.

Mr. W. Mc. Grafton, Signal Engineer of the Pennsyl-

vania system west of Pittsburgh, has been appointed Consulting Engineer in charge of the interlocking at the World's Fair at Chicago.

—Captain Alsdorf Faulkner, General Passenger and Ticket Agent of the Houston & Texas Central, has been appointed General Passenger Agent of the Missouri, Kansas & Texas system.

—Col. D. V. Ahl, ex-President of the Harrisburg & Potomac Railroad, now part of the Philadelphia & Reading, and well known throughout the state as a leading Democratic politician, died suddenly at Newville, Pa., Sept. 16, from heart disease, aged 70 years.

—Mr. George A. Sanderson, at one time General Freight Agent of the Denver, Texas & Fort Worth, and until recently General Agent of the Freight Department of the Louisville, New Albany & Chicago, has been appointed manager of a produce fast freight line, with headquarters at Chicago.

—Mr. Albert Griggs, for many years Superintendent of Motive Power of the Providence & Worcester road and more recently holding the same position on the New York & New England road, has entered the service of Page, Newell & Co., of Boston, as agent for the "Brunswick" car and locomotive wheels.

—Mrs. J. C. Clarke, wife of President Clarke of the Mobile & Ohio road, died at Mobile, Ala., last week, of typhoid pneumonia. One of Mrs. Clarke's daughters is the wife of President E. T. Jeffery, of the Denver & Rio Grande road, and one of her sons, C. S. Clarke, is Superintendent of the Southern Division of the Mobile & Ohio, and another son, Horace Clarke, is Superintendent of the Northern Division of the same road.

—Mr. Williams Robinson, formerly General Superintendent of the Buffalo, New York & Philadelphia, died at Silver Creek, N. Y., Sept. 18, aged 65 years. Mr. Robinson was one of the first employés of the Cleveland & Erie, now part of the Lake Shore. Beginning as conductor, he advanced successively to Assistant Superintendent and then Superintenent of the Cleveland Division. Failing health necessitated a change of climate, and he went to Utah and California for several years. On his return he became General Superintendent of the Buffalo, New York & Philadelphia, now the Western New York & Pennsylvania. For a number of years he had been a confirmed invalid.

—The death of Mr. J. B. Francis ends a useful, sweet and noble life. He had a high intelligence, a resolute will, fortitude, cheerfulness, a pure heart and a blessed sense of humor. The beautifully balanced combination of these high qualities made an extraordinary man. His work in the world added to the knowledge of the learned, the wealth of the producer and the comfort of the masses. He illuminated his high profession, made those near to him happy, and left the world the better for his life, and the serene fortitude with which he faced death was only the logical end of his career. He became a member of the American Society of Civil Engineers in 1852, was twice elected Vice-President, and was President from Nov. 3, 1880, to Jan. 18, 1882. He was a devoted member and officer and constant attendant at the annual meetings and conventions, and the members will miss his sturdy figure, his fresh, humorous and dignified face, his apt discussion and his wise counsel. To the older members he was a dear friend, to the younger ones a kind and sympathetic companion. The following outline of his life and work is taken from the Lowell *Times*, and is, we believe, quite correct so far as it goes.

James Bicheno Francis died in Boston Sept. 18, at 9:15 a. m. He was born at Southleigh, Oxfordshire, England, May 15, 1815. In 1828 his father was appointed Superintendent of the Duffryn, Llynvi & Porth Cawl Railway and the harbor of Porth Cawl to Glamorganshire, South Wales. This naturally led the son to adopt engineering as a profession. In 1829, when only 14 years of age, his first employment was on the harbor works of Porth Cawl, then being constructed. In 1831 he was employed in Devonshire and Somersetshire on the Grand Western Canal, which was at that time being constructed. In 1833 he came to America, landing in New York City on April 11, and soon found employment as an assistant engineer on the New York, Providence & Boston Railroad. In 1834 he went to Lowell, and in 1837 became chief engineer of the Proprietors of the Locks and Canals on the Merrimack River. In 1845 he was appointed agent of the company, and up to 1884 had the management of the water power there and the construction of the numerous improvements that have been made from time to time in the works connected therewith.

A prominent part of Mr. Francis' duty was to distribute the water power among the different users according to their respective rights. This called for many original hydraulic experiments on a large scale, the principal results of which are given in the work entitled "Lowell Hydraulic Experiments," the first edition of which was published in 1855. A second edition, much larger, was published in 1868. Mr. Francis also published a work, "The Strength of Cast Iron Pillars," in 1865 and contributed materially in one way or another to the literature of the special subjects to which he devoted himself. His book on the "Lowell Hydraulic Experiments" has attained the enviable reputation of being a classic and is an acknowledged authority both in this country and in Europe.

His experiments had the advantage of being prosecuted with the utmost degree of exactness attainable, and hence the results serve as data for further experiment and investigation. His experiments on gauging water, both by means of wires and floating tubes, are unparalleled in the quantity of water measured and the accuracy of record. He reduced the standard of error in gauging water to 2 per cent. or less, which is remarkable from the fact that a possible error of 10 per cent. is often allowed.

In 1847 he planned and built the Northern Canal, which is the largest one in Lowell to-day. Another work successfully done under his supervision was the reconstruction of the Pawtucket dam a few years later. In 1875 he introduced the system of recording the amount of water power used each day by the corporations, and in fact did so many things of this nature that to enumerate them would be impossible. He always took a deep interest in the affairs of his city and was identified with all the movements for improvement. During his life he was a member of both branches of the city government as well as a member of the Legislature, being elected to the House of Representatives shortly after the war. He was identified with numerous charities and was moreover charitable and generous in his every-day life.

Mr. Francis was married in 1837 to the daughter of the late George Brownell, of Lowell. She, with four children, survives him. The oldest son is Dr. George E. Francis, of Worcester, the next Col. James Francis, who succeeded his father as agent of the Locks and Canals when the latter retired in 1884. Charles Francis is a civil engineer in Davenport, Iowa

ELECTIONS AND APPOINTMENTS.

Atlanta & West Point.—At the annual meeting of the stockholders the following directors were elected for the ensuing year: C. H. Phinizy, of Augusta; W. B. Berry and H. C. Fisher, of Newnan, Ga; D. N. Speer, T. L. Langston and E. P. Chamberlin, of Atlanta; H. M. Comer, of Savannah. The road is controlled by the Central of Georgia and the Louisville & Nashville.

Brooklyn Elevated.—At the annual meeting of the stockholders, held Sept. 13, the following directors were elected: Simon Uhlmann, Abram J. Hardenbergh, Emil Schaefer, Max E. Bernheimer, Edgar M. Johnson, Walter B. Longyear, Othniel F. Nichols, John W. W. Mitchell, William H. Sidney, Richard Sidenbergh, William N. Cohen, Joseph F. Blaut and Augustus A. Levey.

Catskill & Tannersville.—The following is a list of the incorporators and directors for the first year: Charles L. Rickerson, 54 Harrison street, New York City; A. van Santvoord, Lincoln National Bank, New York City; Geo. M. Snyder, West Hoboken, N. J.; James Stead and Isaac Pruyn, Catskill, N. Y.; Simon Zweighaft, Deer Park, Kaaterskill, N. Y.; Jacob Fromer, Tannersville, N. Y.; W. H. Ritter, 230 W. Thirty-fourth street, New York, and C. C. Hager, 54 Harrison street, New York City.

Chicago Great Western Railway.—F. B. Ross having resigned to accept service with another company, W. O. McNaughton has been promoted to the position of Traveling Passenger Agent, with office at 195 East Third street, St. Paul, Minn.

Clayton & Pea Ridge.—The officers of this recently chartered company are: G. W. Montgomery, President, Clayton, Ill., T. J. Clark, Vice-President, Mt. Stirling, Ill.; B. W. Bryant, Treasurer, Clayton, Ill., and C. A. Wever, Secretary.

Connecticut River.—The annual meeting of the stockholders was held in Springfield, Mass., Sept. 21. George H. Ball, of Boston, was elected to the vacancy in the directory caused by the death of A. B. Harris, and the remainder of the old board were re-elected.

East & West of Georgia.—The following is a list of the incorporators of the company: R. M. Mitchell, of Richmond County, Ga., and R. B. Baxter, Seaborn Reese, Julius Mandle, and E. A. Rozier, all of Sparta, Ga. R. M. Mitchell is the President, and the office of the company is at Sparta.

Glendon & Gulf Mining & Mfg. Co.—The following is a list of the officers of this company, which is building a road from Gulf, N. C.: President and Treasurer, John B. Lennig, Bridesburg, Philadelphia; Secretary and Vice-President, O. E. Maltby, New York City; General Manager, George F. Edmiston, Gulf, N. C., and Chief Engineer, Frank D. Jones, Philadelphia and Gulf, N. C.

Great Northern.—William McMillan has been appointed Traveling Auditor.

C. P. Brynton, who superintended the construction of the Rapid Transit lines in Salt Lake City, and also the Great Salt Lake & Hot Springs road is now Roadmaster of this road from Butte to Fort Benton. His headquarters are at Great Falls, Mont.

Holston Valley.—The incorporators of this company in Tennessee are A. F. Willey, Robert Willey, Bluff City, Tenn.; H. M. Haynes, Thomas G. Curtis and A. S. Tayler, Bristol, Tenn.

Huntington & Big Sandy.—The stockholders of the company met at the office of President Geo. W. Thompson, of the Ohio River road, at Parkersburg, W. Va., last week, and elected the following board of directors: H. H. Moss, Ralph Covert and Harry P. Camden, Parkersburg, W. Va.; Z. T. Vinson, Huntington, W. Va., and J. S. Clark, Philadelphia, Pa. Z. T. Vinson was elected President and Harry P. Camden, Secretary.

Louisville, New Albany & Chicago.—At the adjourned annual meeting of the company John G. Moore, of New York, was elected a director in the place of F. K. Sturgis, who declined re-election; and General Manager W. H. McDoel in place of William L. Breyfogle, who retired six months ago.

Minneapolis, St. Paul & Sault Ste. Marie.—W. A. Munger has been appointed Traveling Auditor, vice E. E. Arnold, assigned to other duties. T. H. Dancy has been appointed Trainmaster of the Minnesota division with headquarters at Minneapolis and will have in addition charge of terminals at Shoreham and Camden Place.

Nashville, Chattanooga & St. Louis.—The stockholders met Sept. 14, and the following directors were elected: J. W. Thomas, G. M. Fogg, W. M. Duncan, A. H. Robinson, J. E. Washington, L. H. Lanier, Jr., M. Burns, Ex Norton, J. Hill Eakin, E. L. Jordan, T. W. Evans, J. W. Sparks, J. H. Inman, J. G. Aydelott and J. D. Probst.

Natchez, Alexandria & Texas.—The company has been chartered with Charles E. Roberts, Natchez, Miss., President; J. G. White, Vice-President; R. W. Bringhurst, Secretary, and G. A. Roberts, Treasurer.

New York, Providence & Boston.—The stockholders of the company held their annual meeting in Providence, Sept. 21. The following directors were elected: Samuel D. Babcock, George H. Miller, Nathan F. Dixon, Robert Knight, Henry C. Robinson, George P. Wetmore, John L. Riker, Benjamin N. Lapham, J. Walter Wood, J. Pierpont Morgan and George G. Haven. S. D. Babcock was elected President; George M. Miller, Vice-President; S. R. Longley, Secretary and Treasurer.

Portland & Rumford Falls.—At the recent annual meeting the following officers were elected: President, Hugh J. Chisholm; Superintendent, L. L. Lincoln; Treasurer and Clerk, R. C. Bradford, all of Portland, Me.; Directors: Hugh J. Chisholm, Daniel F. Emery, Jr., Portland; George C. Wing, Auburn; George D. Bisbee, Buckfield; Waldo Pettengill, Rumford; George W. Russell, Lawrence, Mass.; Galen C. Moses, Bath, Me.

Richmond & West Point Terminal.—At an adjourned meeting of the stockholders held in Richmond, Va., Sept. 14, these directors were elected: William E. Strong, George F. Stone, William P. Clyde, J. C. Maben, Alexander F. Voucher, Thomas F. Ryan, George Bladen, C. A. Low, R. G. Irwin, W. H. Goodley, John W. Hutchinson, Joseph Bryan, Edwin Packard, John A. Rutherford, R. S. Hayes, George J. Gould, Thomas Manson, Jr., Charles McGhee.

At the first meeting of the newly-elected Directors John A. Rutherfurd was re-elected second vice-president; C. J. Raub, treasurer and assistant secretary; W. M. Crump, secretary, and Mr. H. C. Crawford was elected general counsel. A new Executive Committee was appointed as follows: W. P. Clyde, chairman; W. E. Strong, J. C. Maben, George F. Stone, T. F. Ryan, Joseph Bryan and Edwin Packard.

Toledo, St. Louis & Kansas City.—The annual meeting of stockholders of the company was held in Toledo, Sept. 14. The following directors were elected: H. S. Kneeland, J. S. Srout, Randolph F. Purdy, R. G. Ingersoll, Francis L. Russe, W. Howard Gilder, Robert Harris and J. O. Osgood, all of New York; S. R. Callaway, Clarence Brown and M. Crowell, of Toledo, and F. J. Sawyer, of Buffalo.

Wabash.—The directors have organized by re-electing the old officers, as follows: President, O. D. Ashley; Vice-President, Edgar T. Wells; Secretary, J. C. Ottesou; Treasurer, F. L. O'Leary, and General Manager, Charles M. Hays. A committee was appointed to change the by-laws so as to provide for the creation of the office of chairman of the board of directors.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Adirondack & St. Lawrence.—The contractors have practically completed their work on this road, and large numbers of men who have been employed on the construction of the middle section are leaving daily. The grading is finished, but there was about 16 miles of track to lay on Sept. 21, which the company expects to complete by Oct. 15.

Baltimore & Ohio.—The extension of the Fayette County branch, south of Uniontown, Pa., on which work has been going on for several months, has been completed to Smithfield, Pa., and passenger trains will probably be run to that point, about eight miles, on Oct. 1. Contractors are still working south of Smithfield to the state line to connect with the extension of the Fairmont, Morgantown & Pittsburgh line, which is being built northeast of Morgantown, W. Va. The completion of the road between Morgantown and Uniontown, Pa., will give a new outlet to the large coke fields in the southern part of Fayette County to the South and West.

Cairo & Devil's Hole.—Henry S. Wilson & Bond, of Parkersburg, W. Va., timber men and owners of the above named road, have decided to extend the line from its present terminus in the Little Kanawha Valley to Smithville, Ritchie County, W. Va.

Calgary & Edmonton. — The first train over the southern division was run through from Calgary south to MacLeod, Alberta, Sept. 10. The only work uncompleted is the ballasting on about 12 miles of the division. Work has been commenced on the new line through Crow's Nest Pass.

Canadian Pacific.—Mr. Buchanan, who has a large gang of men at work grading on the "Soo" extension, says good progress is being made on the new line, several contractors being at work between Estevan, Man., and the United States boundary and north of the new townsite of Estevan.

Charleston, Clendennin & Sutton.—On last Thursday the County Commissioners of Kanawha County, W. Va., which county has subscribed $200,000 of the stock of the company, made a tour over the line for the purpose of determining whether or not sufficient progress had been made to warrant the payment of the second installment of the county's subscription. It was found that the track had been laid for a little more than six miles from Charleston, and that three miles more would be laid in a week. The masonry and roadbed were found to be first class, and the installment will be paid. The work will be pushed with all possible rapidity until Clendennin is reached, which will probably be about Christmas. It is feared that the low water in Elk River might interfere with the securing of railroad ties, which might seriously disarrange matters. The report that 50 miles of the road was completed was an error.

Cherry Run & Potomac Valley.—The Baltimore & Ohio Railroad's engineer corps has begun the second survey of this road, which is to be built by the Baltimore & Ohio for the purpose of reducing grades between Cherry Run and Harpers Ferry, Md. The route of the first survey followed the Potomac River all the ways, keeping about at the high water mark. This second survey is taking short cut across necks of the river, and is straightening and improving the former line, wherever possible. The new survey shortens the distance considerably, but puts in quite a number of bridges, trestles and culverts, and contemplates one or two tunnels.

Chicago, Burlington & Northern.—The reports recently printed that this company would build a branch of the road to Hanover, in the northwestern part of Illinois, are incorrect. The engineers have made a survey to Hanover, but it was simply a preliminary line to get levels, etc., and there is no probability of any further work being done this year.

Chicago & West Michigan.—The current reports that this company has made or is making surveys for a line from New Buffalo to Michigan City, Ind., are incorrect. The company is not interested in the construction of a line between those points. The surveys have been made by a local company.

Clayton & Pea Ridge.—The contract for building and equipping this road has been let to the D. M. Halstead Construction Co. C. M. Wever, of Clayton, Ill., is Secretary of that company and also of the road. The company was recently incorporated, and the line is to extend from Clayton, in Adams County, northeast to a point near Huntsville, in Schuyler County, a distance of about 12 miles. The surveys for the line have not yet been made. The object of the road is to reach extensive coal fields near its terminus, and leases have been secured on 3,000 acres of coal lands, the veins averaging 3½ ft. in thickness.

Crystal Creek.—Orman & Crook, who have the contract to build the road, have begun the grading at the junction of Coal and Rock Creeks and will first complete the grade to Coal Basin, Col.

Fairmont Belt.—The Fairmont Development Co. has made surveys for the construction of the belt line road, to be built round the city of Fairmont, W. Va. The managers have made arrangements with the Baltimore & Ohio for the operation of the road, and they will ask for bids for the construction of it shortly. The road will be about six miles long, and will reach the coal mines and factories on the outskirts of the town.

Findley, Ft. Wayne & Western.—The contracts for the grading and bridging from the Ohio and Indiana State line west to Ft. Wayne, Ind., 18 miles, have been let and the work is now in progress. The grading and bridges are completed from the Mackinaw River to the State line, and track-laying upon that part of the line will go forward in a few days. The work of ballasting is closely following the track-laying. The road will be opened for traffic into Ft. Wayne this year.

Glendon & Gulf Mining & Manufacturing Co.—This company has begun the construction of a road, as already reported, which is to extend from Gulf, connecting with the Cape Fear & Yadkin Valley road along Deep River, through Carbonton to Fair Haven; from this point it has not been decided in what direction to build. The route has been surveyed from Gulf to Fair Haven, a distance of 12 miles, and about 200 men are grading this section, three miles being graded. The tracklaying will begin on Aug. 15. The character of the work is medium, the heaviest grade being two per cent. and curvature 10 degrees. One wooden bridge across Deep River will be built and several small trestles. The equipment has not yet been purchased. G. F. Edmiston, Gulf, N. C., is General Manager.

Great Northern.—The survey for the proposed line northeast of the Park Rapids, Minn., has been completed to Leech Lake a distance of about 25 miles, and the engineers are now cross sectioning the line. It is stated that the grading will be commenced in October. The new line will be practically an extension of the Wadena & Park Rapids road, which was built in 1891.

Harriman Coal & Iron.—About three miles of track has been built this year by the company at Harriman, Tenn., but no men are working on the extension at present. The surveys have been made for the Brushy Mountain extension, but the work is delayed owing to the failure to secure the money needed for the road. About $50,000, or half the amount necessary, has been subscribed. W. Kenefick, of Johnson City, Tenn., has the contract for grading. The work is not difficult except one mile of grading which will be regrading, as it was and will be hillside work in a gorge of East Fork of Little Emory River. One trestle 60 ft. high will be built and several smaller ones, all built, except possibly one on the last three miles of the grading. The new line from Harriman to Big Brushy Mountain coal field, passing through or near Webster, De Armond, De Armond Gap of Walden Ridges and East Fork Gap of Brushy Mountains.

Holston Valley.—The incorporation of this company in Tennessee to build from Bristol, Tenn., east to Damascus, Va., was noted last week. It is not proposed to build the entire distance at present, and it has not been decided whether to build the road to Bristol or Bluff City, but the route will be settled during the next 30 days. A. F. Willey, of Bluff City, Tenn., is one of the directors.

Huntingdon & Broad Top.—The short branch, 2¼ miles long from Six Mile Run, Pa., up Shreeve's Run to the mines of the Six Mile Run Coal Co. now under construction will be finished in about amonth, when it is expected to contribute a considerable tonnage to the main line.

Iberia & Vermillion.—Mr. Chris Kiel, the contractor, says that on account of the nearly continuous rain since he took the contract the work has been greatly retarded. The line is only 16 miles long and all but four miles has been graded. The work is done under many difficulties, but he expects to have the work completed by Oct. 10. The first rails will be laid this week toward Abbeville, La.

Idaho, North & South.—The route followed in the recent surveys is described as commencing at Nampa and crossing the Snake River about two and a half miles below Walter's Ferry. From the river the route is southwest up Reynold's Creek canyon to Reynold's Creek, over a four per cent. grade. From Reynold's Creek the road follows the eastern slope of the divide between the creek and Snake River to the Silver City summit, that distance being over a three per cent. grade. The road follows the eastern slope, leaving Boonville one and a half miles to the east and enters Silver City about 50 miles from Nampa. The surveyors went over part of the route south of Silver City toward South Mountain.

Kanawha & Michigan.—The extension of this line in the Kanawha Valley, W. Va., to a connection with the Chesapeake & Ohio is being pushed forward rapidly. About eight miles of the road has been graded, and as the work on the Chesapeake & Ohio is also being pushed vigorously, the junction of the two roads will soon be made.

Lancaster, Cecil & Southern.—The road has been completed from Childs' Station, Md., on the Baltimore & Ohio, Philadelphia Division, to Garrett's wallpaper mills, four miles, where freight is being carried. It is said that the survey of the road from Providence to Oxford, Pa., nine miles, will be commenced in October. An extension from the contract time, Aug. 20, has been granted the contractor in which to complete the line to Providence, Md. The road is now graded to Elkton, Md.

Minneapolis, St. Paul & Sault Ste. Marie.—On the 17th inst. only 15 miles of track had been laid on the extension from Valley City, N. D. Rails are now being put down at the rate of one and a half miles a day, and if the weather continue good the next 30 miles will be finished in 20 days.

The contract for building a three-mile branch, leaving the main line one mile west of Armstrong Creek station, Wis., has been let to Charles Wordenhoff, of Minneapolis. This branch is to be completed on Nov. 1, and the contract calls for the completion of the grading by Oct. 15.

Missouri, Kansas & Texas.—The local papers report that the company has decided not to use the track of the Texas Western from Sealy to Houston, but will build a separate line. It is expected that the line from Lockhart east to Smithville, and from Boggy Tank to Sealy will all be completed about Nov. 1. The road has now been graded a distance of three miles east of Sealy, toward Houston. Concerning the route of the latter line, it is stated that the new line will cross the Brazos River about two miles south of the Texas Western bridge, at the Pattison ferry, and will cross the Texas Western about one mile and a half east of Leslie, and crossing the tracks of the Houston & Texas Central just south of Eureka Mills.

Montpelier & Chicago.—W. P. Chapman & Co., of Elgin, Ill., have been awarded the contract by the Wabash for tracklaying and ballasting on the extension from the present end of track, near Montpelier, O., west of Hammond, Ind., a distance of 154 miles. The work on this contract will be commenced this week.

Montreal & Sorel.—A meeting of the Quebec provincial cabinet was held last week, when a numerous delegation from the South Shore, between Longueil and Sorel, Que., waited upon the Ministers to urge the necessity of having the repairs completed on the whole of the Montreal & Sorel Railway. The Ministers, after discussion, informed the delegation that the government engineer would go over the road with the company's engineer, and after their report, material aid might be expected from the Government.

Nashville, Chattanooga & St. Louis.—The newspaper reports of the annual meeting at Nashville last week state that the stockholders authorized the purchase of the division in Hickman County, Tenn., from the Southern Iron Company, owners of the branch, who had agreed to sell the road to the company for $125,000. The reports seem to refer to the Centreville branch, which is about 46 miles long, and has been operated by the company for some time from Dickson, Tenn., to the Lewis County line.

Natchez, Alexandria & Texas.—C. W. Siler, of Memphis, Tenn., has organized an engineering party to make the preliminary survey for this road from Natchez, Miss., in a southwesterly direction through Louisiana to the north state line of Texas in Newton or Jasper counties. Charles E. Roberts is President of the new road and R. W. Bringhurst is Secretary.

National of Tehuantepec.—The following report gives an account of what has been accomplished on the construction of this road this year, since the contract was made with the present concessionaires. The road is owned by the Mexican Government and the title in English is The National Railroad of Tehuantepec. It is 190 miles long, extending from the mouth of the Coatzacoalcos River on the north to Salina Cruz on the Pacific Ocean. The concession for completing the work was given last spring by the Mexican Government to Messrs. Stanhope, Hampson and Corthell. The work was begun in March and has been actively prosecuted up to the present time with a large force. The track is laid for about 72 miles on the north side, and on the south side the track is laid about 47 miles, leaving about 71 miles of track to lay. The line between the ends of the track has been located and work is under way nearly the entire distance. It is expected that the rails will be joined across the Isthmus by June of next year. The rainy season, as is usual in the tropics, has interfered somewhat with the rapid progress of the work on the Atlantic slope, but has done no damage to the work in any way.

The maximum grade, and that only for comparatively short distances, on the Pacific slope is 2 per cent. There is no curvature over ten degrees. The iron bridges are not of any considerable length. There are several iron trestles on the south side of from 60 to 75 ft. in height and one tunnel of about 300 ft., which is completed and lined with brick. The money that is now being expended is the residue of the proceeds of £2,700,000 of Government bonds. The amount remaining is expected to be enough to complete the railroad so far as uniting the tracks. The road is fairly equipped; locomotives being American, English and Belgian. The cars are American and English. The rails are 56 lbs. to the yard, mostly English rails. The road is owned by the Mexican Government. The concessionaires are Chandos S. Stanhope, San Juan de Letran, No. 13, City of Mexico; J. H. Hampson, same address, and E. L. Corthell, "The Temple," Chicago.

New Roads.—A survey has recently been completed under the direction of C. P. Rogers, of Richmond, Va., for a road about 12 miles long, to extend from Greenville, Ala., west to the Alabama River through Butler County. The road is to be built by the Gulf Red Cedar Co., formerly the Richmond Cedar Works. Part of the contracts have been let and the grading has already begun, but other contracts will also soon be let. W. H. Parrish, of Richmond, is President. The company also has an office at Greenville, Ala.

Oscar Reuter, Henry Lee, Henry Stuart and others interested in the proposed new road from Denver to Golden will go over the various routes proposed this week and will determine on the route for the new road.—*Denver paper.*

Norfolk & Western.—The eastern and western ends of track of the Ohio extension were, at the last report we have received, respectively at Hatfield Bend and Pondmouth, W. Va., the distance apart being about seven miles, and it was confidently expected that the two ends of track would be joined by Sept. 24 at the very latest. As previously stated in our columns the Ohio extension fills in the gap between Elkhorn, W. Va., and Ironton, O., a distance of 190 miles. The Ohio River is crossed at Kenova. Trains on the western end are running as far as Dunlow, while at the eastern end train service extends to Roderfield, which leaves a gap of 110 miles yet to be operated.

The company has disbanded its engineer corps, which has been at work on preliminary survey from the main line of the Ohio River extension up the left fork of Twelve Pole River, in lower West Virginia. It has not been stated whether it is the intention to permanently abandon this enterprise or not.

Ohio River.—This company has leased the uncompleted lines of the Huntington & Big Sandy, and is now putting forth every effort to complete the line to Kenova, Va. The Ohio River road is building an independent line of its own, including a bridge over the Guyandotte River, to Huntington, W. Va. Heretofore the road has entered Huntington over the tracks of the Chesapeake & Ohio. This new line will be completed by Oct. 1, unless there is some unforeseen hindrance. The company is also building new passenger and freight stations at Huntington, which it hopes to have completed by that time. The Huntington & Big Sandy road, which is a new line now under construction, will start from the Ohio River station at Huntington and extend to Kenova at the junction of the Ohio and Big Sandy rivers, a distance of 12 miles. This company was chartered about a year and a half ago, and began active construction work at once. It has had several setbacks, being enjoined on two different occasions from following its surveyed lines and having to condemn a considerable portion of its right of way. A few weeks ago, J. H. Dingee got an injunction from the United States Court to stop the road from building into the town of Kenova over a route it had condemned. Judge Jackson of the United States Court set aside the proceedings in the State Circuit Court, and ordered the appointment of new commissioners to assess the damage a second time. Work on the line, however, has progressed considerably, and with no further mishaps or delays the road will likely be completed before the first of the year. One point on the line which has delayed the construction considerably is the bridge over Twelve Pole River. The foundations for this structure are now completed and the superstructure is now erecting. The Huntington & Big Sandy will connect with the Norfolk & Western belt line at Kenova, and the Ohio River road by leasing it, as has been done, gets a through line from Wheeling, W. Va., to Kenova, W. Va., connecting at one end with the Pennsylvania system, and at the other with the Norfolk & Western.

Ottawa, Arnprior & Parry Sound.—A large number of men has started work near Ottawa. The line will connect with the Canada Atlantic in the vicinity of St. Louis dam. It is understood that President Booth is still determined to extend the road through to Parry Sound, Ont., notwithstanding the threats of other companies to build to Parry Sound.

Pittsburgh, Cincinnati & St. Louis.—This company has 200 men at work extending the New Cumberland (West Virginia) branch to a point opposite East Liverpool, O. The distance is about five miles and the work is expected to be finished by Oct. 1.

Pittsburgh, Ohio Valley & Cincinnati.—This road will be running through to Powhattan, O., by Oct. 1. The bridge over a small creek near Powhatan which has been delaying the work is about completed. As soon as the work is finished to Powhatan a daily train will be put on between that point and Bellaire, connecting with the Cleveland & Pittsburg road.

Powellton & Pocahontas.—The preliminary survey for the new road has been commenced. The road is now built and in operation from Mount Carbon station, on the Chesapeake & Ohio road, to Mount Carbon mines, and the extension will be from that point east to the Norfolk & Western, a distance of something over 60 miles.

Santa Fe, Prescott & Phœnix.—E. M. Dickey, Treasurer of the company, says that the report published in the papers in regard to the suspension of work on this road are not correct. Grading and tracklaying are progressing as fast and with as many men as can be worked to advantage. The road will be finished from Ash Fork south to Prescott, Ariz., 60 miles, this fall. The report that work had been stopped grows out of the fact that a small contractor absconded. The road is being built under a favorable traffic contract with Atchison and will be, not only a good feeder for Atchison, but a factor of importance in developing the agricultural and mineral resources of Arizona.

Seattle Terminal.—Plans for a terminal company system, including union stations, yards, etc., to be located on the water front, Railroad avenue, have been submitted to officials of the Northern Pacific, Oregon Improvement and Great Northern. A conference of officials will be held soon to discuss the plans.

Silver Lake.—President A. G. Yates, of this road, has made a proposition to the manufacturers along the outlet of Silver Lake to extend the line of the road through the village of Perry, N. Y., if the right of way can be secured.

Slaughters Creek.—This company has been chartered at Charleston, W. Va., with a capital stock of $50,000, and its principal office at Charleston, for the purpose of building a road from a point between Peerless and the mouth of Slaughters Creek on the Great Kanawha River, to the head of Slaughters Creek, in Boone County, a distance of 60 miles. A. A. Low and four others, of Brooklyn, N. Y., are the incorporators.

South Bound.—It is reported that the first contracts for the grading for the Jacksonville extension will be awarded before Nov. 1, and that it is intended to let the first 40 miles south of Savannah to Jamaica, a point on the Brunswick & Western northeast of Brunswick, Ga. The survey for the extension is being rapidly completed, and the line to Jacksonville or Hart's Roads will probably be about 107 miles long. Thomas D. Lee, of Columbia, S. C., is the engineer in charge of the location.

South Shore.—This company was incorporated in Pennsylvania Sept. 15 to build a road 4¾ miles long, to extend from Esplere, Allegheny County, Pa., up the Ohio River and up the Monongahela River to a point near the foot of South Thirtieth street, in the city of Pittsburgh, Pa. The capital is $100,000. Robert S. Fraser, of Pittsburgh, is President, and A. M. Keeper and Ernest E. Jones, also of Pittsburgh, are directors.

Tavares, Atlantic & Tampa Bay.—The work of clearing the right of way east of Tavares, Fla., will probably be commenced at once. The survey has been completed east of that point to Lake Helen, about 30 miles. About three miles of the line has been graded west of Tavares to Lake Harris, but the work has been delayed on account of the trestle which it is proposed to build across Lake Harris. E. L. Ferran and St. Clair Abrams, of Tavares, Fla. are directors.

Tennessee Midland.—By a vote of 31 to 28 the Davidson County Court has refused to submit to a vote of the citizens a proposition to subscribe $350,000 to the capital stock of the Tennessee Midland Railroad. The Paducah, Tennessee & Alabama, which controls the road, petitioned that an election be called to vote on the proposition agreeing to build from Perryville east to Nashville.

Tobique Valley.—Ald. Conner reports that the section of this New Brunswick road now under construction will be completed and ready for traffic in about six weeks. All the men available are being hired to push the road to completion before the frost stops work.

West Virginia, Central & Pittsburgh.—The survey just completed from Hancock, Md., northeast to the town of State Line, Pa., connecting with the Cumberland Valley road, was made by the engineers of this company. The survey was begun early in the spring, and the new line is proposed as a branch of the Baltimore & Cumberland, which is controlled by this company, and has been surveyed from Cumberland, Md., along the Cumberland Canal to Hagerstown and east toward Baltimore.

It has been definitely stated by the officers of this company that for this season, at least, the surveys looking to the building of a branch line from Beverly, Randolph County, W. Va., up the Tygarts Valley River to Mingo, and thence by way of the Elk River and the Greenbrier River ultimately to White Sulphur Springs and a connection with the Chesapeake & Ohio has been abandoned. Considerable preliminary work on this line was done several years ago, and has lain untouched since. As stated Aug. 19 last, the company will soon put a small party of engineers in the field to work out a route from the headwaters of the Tygarts Valley River over to the Greenbrier River, which is the most difficult part of the line.

West Virginia & Pittsburgh.—Senator Camden, President of this road, is reported in the Baltimore *Herald* as saying that the Gauley extension will be completed by Oct. 1, and that this will be the end of the work for the present. He also stated that the next work would be to build the extension to connect with the Chesapeake & Ohio. The Buckhannon extension of this line has been completed. The track on the main extension is laid as far as Welsh Glade, leaving about six miles more to be laid. This can be completed in a few days now, and can be turned over ready for regular trains.

Wheeling & Lake Erie.—Press reports from Wheeling state that the officials have completed negotiations for rights of way for an extension from Martin's Ferry south to Bellaire, O., a distance of six miles. At Bellaire the Wheeling & Lake Erie will connect with the Baltimore & Ohio. The new line, if built, will be costly, as the right of way damages will be heavy, and the line will be along the narrow western bank of the Ohio River.

Yankton, Norfolk & Southern.—William Larson, who has the contract for building this road south of Yankton, S. D., is arranging to place 500 additional men on the grading south of the Missouri River.

GENERAL RAILROAD NEWS.

Cheraw & Salisbury.—The holders of the first mortgage bonds of the road are taking steps to secure the foreclosure of the mortgage and the sale of the road from Cheraw, S. C., to Wadesboro, N. C., a distance of 25 miles. It is operated by the Atlantic Coast Line.

Chicago, Rock Island & Pacific—The Company filed a declaration in the Circuit Court at Chicago, Sept. 12, in its damage suit against the Union Pacific. According to a contract executed in May, 1890, the Rock Island claims that the Union Pacific was to lease and jointly occupy the tracks, from McPherson, Kan., extending west on the Arkansas River to South Hutchinson, and also the line between South Omaha and Lincoln. The Union Pacific, it is alleged, never kept the agreement and for the first mentioned road the Rock Island seeks to recover $19,045 and for the latter line $69,670 for rentals.

Cleveland, Lorain & Wheeling.—Arrangements have been made with the Wheeling Bridge & Terminal Railway Co. to run the trains of the former road into the union station at Wheeling, W. Va. Heretofore the trains have not been run beyond Bridgeport, O., and passengers were transferred to Wheeling by street car line and freight by steamboat and barges. It has also been arranged by the two companies that accommodation trains shall be run over the joint lines of the two companies between Wheeling, W. Va., and Martins Ferry, Ætnaville, Bridgeport, West Wheeling and Bellaire, O. This arrangement will greatly facilitate rapid transit passenger traffic among the towns named.

Clove Branch.—A press dispatch from Poughkeepsie, N. Y., states that the Philadelphia & Reading is negotiating with J. S. Shultz, of Matteawan, N. Y., for the purchase or lease of this road, which extends from Hopewell to Sylvan Lake, N. Y., four miles. The purpose of the Reading is to operate the Clove Branch in connection with the Dutchess County Railroad for the shipment of ore. An extension of the Clove Branch road has been surveyed and will be built by ex-Congressman Frederick Miles for the transportation of ore from his own mines.

Empire & Dublin.—This road, extending from Hawkinsville to Dublin, Ga., a distance of 40 miles, which has been in the hands of a receiver for some time, has been purchased at foreclosure by Claude Estes, of Macon, representing New York parties.

New York Central & Hudson River.—The annual report for the year ending June 30, 1892, covers 2,096 miles of road operated. In the year the cost of road and equipment increased by $2,583,000 charged to construction account and expended for construction and equipment. A still further sum was expended in charge of operating expenses. The funded debt was increased during the year by the issue of $3,000,000 4 per cent. bonds. The results of operation for two years were as follows:

	1892.	1891.		
Gross earnings	$45,478,625	$37,902,115	Inc.	$7,576,510
Oper. expenses	31,139,113	25,370,852	Inc.	5,768,261
Exp. to earnings	(68.47)	(66.94)		
Net earnings	$14,339,512	$12,531,263	Inc.	1,808,249
Fixed charges	9,805,881	8,881,965	Inc.	923,916
Profit	$4,533,631	$3,739,298	Inc.	884,333
Dividend	(5) 4,471,415	(4) 3,577,132	Inc.	894,283
Surplus	$62,216	$72,166	Dec.	$9,950

The earnings and expenses were:

Earnings:	1892.	1891.		
Freight	$26,866,944	$21,456,473	Inc.	$5,410,471
Passenger	13,305,083	11,681,109	Inc.	1,621,574
Rents	1,899,827	1,690,996	Inc.	208,831
Mail	1,296,730	1,223,404	Inc.	73,326
Express	1,150,554	995,499	Inc.	154,055
Telegraph	14,281	11,244	Inc.	3,037
Interest	638,837	559,577	Inc.	77,260
Miscellaneous	308,768	293,812	Inc.	14,956
Totals	$45,478,625	$37,902,115	Inc.	$7,576,510
Expenses:				
Traffic	$13,275,619	$10,365,628	Inc.	$2,909,990
Motive power	8,333,602	6,743,992	Inc.	1,589,609
Maintenance of cars	2,448,448	1,954,185	Inc.	494,263
Maintenance of way	4,189,087	3,724,522	Inc.	465,185
General	1,468,047	898,423	Inc.	569,623
Taxes	1,424,991	1,686,102	Dec.	261,110
Totals	$21,139,113	$25,370,852		$5,768,261

Some of the transportation statistics are:

	1892.	1891.
Passenger train, miles	13,371,644	11,122,747
Freight train, "	11,484,181	11,558,246
Switching and work train, miles	13,157,010	10,185,934
Total train mileage	41,012,835	32,866,927
Passengers carried	22,213,637	20,057,234
Miles	687,038,796	597,406,825
Tons carried	22.7 5,262	18,378,060
Ton-miles	3,830,033,593	2,893,066,746
Ton-miles company's freight	253,161,520	206,362,035
Total tons-miles	4,083,195,113	3,098,428,711

The flour carried in 1892 was 851,000 tons against 675,000 in 1891 and the grain was 3,244,000 tons against 1,592,000, the total being nearly twice as much as in the latter year. There were increases on all other items, but, naturally, none nearly so great. The receipts per ton mile were .70 cent in 1892 against .74 in 1891 and the profits .16 against .17 cent. The passenger receipts per mile fell but .02 of a cent, that is to 1.94. The earnings and expenses per train mile varied but slightly from the previous year.

New York & New England.—State Comptroller Staub, of Connecticut, has decided not to register additional bonds of the road until the courts have decided whether such registration is lawful under the Connecticut law. He advises that the injunction case in court be brought to trial immediately. In a letter to the counsel on both sides he says: "From such statements as have been made to me by each side, and an examination of the returns of construction account made during the past few years to the Railroad Commissioners, there is very great doubt whether these bonds can be legally registered. It depends upon the construction the courts may put upon the statutes. If the claims made by those who are opposed to the registration of the bonds concerning the present condition of the New York & New England road and its construction account are correct, it would seem as if the spirit of the law is against the registration of any more bonds at the present time. The suits which are in the Superior Court raise questions which, when finally determined, may settle the question whether under the law I can legally register the proposed new bonds."

New York, New Haven & Hartford.—At the annual meeting to be held in New Haven, Conn., Oct. 19, there will be submitted for the approval of the stockholders the leases of the Housatonic, the New Haven & Derby, the Danbury & Norwalk and the Providence & Worcester, all for 99 years. There will also be submitted the act of the General Assembly of Rhode Island to authorize the leasel of the New York, Providence & Boston.

Northern Pacific.—The financial statement for July, including the Wisconsin Central, is as follows:

	1892.	1891.	Inc.
Gross earn	$2,718,284	$2,441,544	$276,740
Operating expen	1,628,968	1,478,747	150,241
Net earn	$1,089,296	$962,807	$126,489
Other income	141,347	110,319	31,028
Total net earn	$1,230,643	$1,073,126	$157,517
Fixed charges	1,182,806	1,050,724	132,082
Surplus	$47,836	$22,402	$25,434

Philadelphia & Reading.—This company, operating the Lehigh Valley, has made a contract for trackage rights so that it will run trains into Elmira, N. Y., over the New York, Lake Erie & Western from Waverly, 18 miles east of Elmira. The long-existing arrangement by which the trains of the Lehigh Valley ran between Waverly and Buffalo on the Erie tracks resulted in the establishment of Elmira as an important station for the Lehigh Valley, and this new arrangement is doubtless made to preserve the traffic to and from that point. It is not clear from the reports whether the contract is for freight trains alone or for both freight and passenger. This arrangement virtually makes an Elmira branch for the Reading, as what is now the main line to Buffalo runs northward from Waverly.

Richmond & West Point Terminal.—At the special meeting of the stockholders at Richmond, Va., Sept. 14, the directors whose names are given in another column were elected. The ticket elected was presented by the Proxy Committee, of which W. E. Strong, of New York, is chairman, and was elected by a vote of 400,112 shares out of a total of 570,010 votes cast. Only four members of the retiring Board were re-elected. Before the meeting adjourned the following resolution, offered by Mr. J. C. Maben, was passed: *Resolved*, That the Board of Directors this day elected be requested to investigate the past history of the company and its various transactions and to employ such counsel and experts and take such steps as they may deem for the best interest of the company, and make a report thereof at the next general meeting of the stockholders." The meeting adjourned till Oct. 26, when any report to stockholders will be heard.

Union Pacific.—The statement of earnings for July shows net earnings of over $1,500,000, an increase of $373,000 over last year. Gross earnings increased $169,861, but operating expenses were reduced $204,017. The earnings and expenses of the system and of various of the divisions are given below:

OREGON SHORT LINE & UTAH NORTHERN.

Month of July:	1892.	1891.	Inc. or dec.	
Gross Earnings	$699,200	$654,012	I.	$45,188
Oper. expenses	381,387	394,045	D.	12,658
Net earn	$317,813	$259,937	I.	$57,846
Mileage	1,424	1,421	I.	3
Since Jan. 1.				
Gross earnings	$3,991,035	$4,356,192	D.	$365,157
Oper. expenses	2,432,103	2,692,117	D.	260,014
Net earn	$1,558,932	$1,664,075	D.	$105,143

UNION PACIFIC SYSTEM PROPER.

Month of July:				
Gross expenses	$3,615,357	$3,500,823	I.	$114,534
Oper. expenses	2,133,240	2,373,113	D.	239,873
Net earn	$1,482,117	$1,127,709	I.	$354,408
Mileage	7,671	7,668	I.	3
Since Jan. 1:				
Gross earnings	$22,692,873	$22,416,628	I.	$276,245
Oper. expenses	15,600,156	15 522,14	D.	521,990
Net earn	$7,092,717	$6,894,482	D.	$798,235

GRAND TOTAL OF UNION PACIFIC SYSTEM.

Month of July:				
Gross earnings	$3,750,149	$3,580,288	I.	$169,861
Oper. expenses	2,241,167	2,445,185	D.	214,018
Net earn	$1,508 982	$1,135,103	I.	$373,878
Mileage	8,147	8,143	I.	4
Since Jan. 1:				
Gross earnings	$23,728,423	$23,017,652	I.	$710,770
Oper. expenses	15,735,672	16,099,128	D.	363,456
Net earn	$7,992,751	$6,918,524	I.	$1,074,226

TRAFFIC.

Traffic Notes.

The Erie this week reduced the fare between New York and Buffalo to $6, $2 less than the regular rate, and the West Shore at once followed it. The misuse of excursion tickets from Buffalo to Washington via New York is said to have been the cause, and the Delaware Lackawanna & Western is alleged to be the guilty party.

A dispatch from San Antonio says that very large shipments of corn are being sent to Mexico to supply the market there before the suspension of the order allowing the (temporary) importation of corn free of duty. The corn comes mostly from Illinois and Kansas, and on Sept. 18 there were 1,600 cars in transit on the divisions terminating in San Antonio.

The Soo Line, in making reduced rates to Boston to compete with the G. A. R. excursion rates via Chicago, also announced similar rates (about $3 less than those agreed upon) to Albany and New York; as well as to Boston, thus greatly disturbing the officers of the Chicago roads; but the New York Central and the West Shore decided not to honor the reduced rate tickets, and they therefore did no harm.

The Philadelphia Car Service Association, in the month of August, handled 121,015 cars, of which only 3½ per cent. were detained over 48 hours. The average detention per car was 1.33 days. Of the cars handled 46 per cent. were on the Reading, 46 on the Pennsylvania and 3 per cent. on the Baltimore & Ohio. The Western New York Car Service Association handled 34 443 cars in August, and the average detention was 2.14 days; only 3.2 per cent. of the cars were detained over 48 hours.

The Colorado Traffic Association, an organization of merchants and manufacturers in Denver, which was started several months ago, but which has not shown signs of life for some time, has taken on new activity and is looking about for a railroad man to fill the office of Commissioner. Frank Janes, of the Pennsylvania, and E. H. Hinton, late of the Texas & Pacific, are mentioned for the position. The proposal to establish a freight bureau in Philadelphia, which also has been held in abeyance for a long time, has again taken shape, and a committee is at work on the subject. From inquiries made at Chicago, Kansas City, St. Louis, San Francisco and elsewhere, the Philadelphians think they can run such a bureau for $10,000 a year.

The Southwestern Railway and Steamship Association.

The lines in this association have voted to place the affairs of the association in the hands of the Secretary, to be closed on or before Dec. 31. At the last meeting an attempt was made to re-elect Chairman Faithorn, whose term of office expires by limitation Sept. 30, but owing to the opposition of one member, understood to be the Missouri, Kansas & Texas, no election could be had, the by-laws requiring a unanimous vote. Forty ballots were cast before the attempt was given up, all the other lines voting to re-elect the Chairman. Resolutions highly complimentary to the retiring Chairman were adopted. A meeting is to be held Oct. 21 to see what will be done about forming another association.

Chicago Traffic Matters.

CHICAGO, Sept. 21, 1892.

Passenger rates in Ohio River territory are again in a demoralized state. The Monon has put in effect a rate of $3.50 on second class, Chicago to Louisville and Chicago to Cincinnati. Other reductions are likely to follow.

Chairman Midgley has gone to New York to confer with representatives of Eastern and Southern Lines, and will endeavor to bring about a restoration of freight rates to the West via Savannah and Newport News. While there he will also try to secure a meeting of the Canadian Pacific and lake lines to see what can be done toward restoring St. Paul rates.

The Alton has discontinued all reduced passenger rates between Kansas City and Chicago and restored all rates to the regular tariff basis in effect prior to Aug. 20.

The Freight Committee of the Central Traffic Association has voted to continue in effect until Jan. 1, 1893, the present rates on pig iron and articles taking pig iron rates and cast iron pipe.

The Joint Committee of the Trunk Lines and Central Traffic Association have agreed to the following rules in respect to the distribution of car-load shipments among various consignees:

1. In order to entitle a shipment to the car-load rate a quantity not less than the minimum car-load weight must be delivered at one station in one day, consigned to one consignee and destination.
2. Agents at destination will not distribute car-load shipments of property among two or more consignees.
3. Agents will not send notice of arrival to more than one party, and will make only one expense bill for the charges on entire car-load.
4. In case one party will not accept notice of arrival as consignee and pay the charges on the entire car-load, agents are required to make separate notices and expense bills, and correct expense bills, and correct the way bill and collect on each shipment at less than car-load rate.
5. The foregoing rules will apply on "to order" shipments as well as on all other car-load shipments.

The Western roads are considering a proposition to make harvest excursion rates Sept. 27 apply to all points in Manitoba on the Canadian Pacific and the Manitoba & Northwestern from Minneapolis, St. Paul, Duluth and the Superiors.

The Santa Fe will make a round trip rate at $35 between Chicago and Denver, Oct. 20 to 25, on the ground that the Alton made this rate for delegates to the Woman's Christian Temperance Union Convention.

On Sept. 20 the Nickel Plate road made $14 round trip rate to Buffalo, an $8.50 one way rate to the same point, and a $12.50 one way rate to New York. The other roads at once met and considered the matter but took no decisive action. On the 21st President Caldwell agreed to withdraw the $12.50 rate to New York, but did not withdraw the $8.50 rate to Buffalo.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Sept. 17 amounted to 63,751 tons, against 55,540 tons during the preceding week, an increase of 8,211 tons, and against 60,191 tons during the corresponding week of 1891, an increase of 3,560 tons. The proportions carried by each road were:

Roads.	W'k to Sep. 17.		W'k to Sep. 10.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	10,569	16.6	9,556	17.2
Wabash	3,409	5.4	3,595	6.5
Lake Shore & Michigan South.	9,989	15.7	7,365	13.3
Pitts., Ft. Wayne & Chicago	6,580	10.3	4,865	8.8
Pitts., Cin., Chicago & St. Louis	7,476	11.7	8,434	15.2
Baltimore & Ohio	3,813	6.	3,381	6.1
Chicago & Grand Trunk	4,593	7.2	4,395	7.9
New York, Chic. & St. Louis	6,659	10.4	5,913	10.6
Chicago & Erie	8,419	13.2	7,553	13 6
C., C., C. & St. Louis	2,244	3 5	484	0.8
Total	63,751	100.0	55,540	100.0

Of the above shipments, 2,448 tons were flour, 25,067 tons grain and millstuff, 10,613 tons cured meats, 12,646 tons dressed beef, 1,409 tons butter, 2,600 tons hides, and 6,231 tons lumber. The three Vanderbilt lines carried 42.7 per cent., the two Pennsylvania lines 22 per cent. The lake lines carried 130,422 tons, against 86,876 tons during the preceding week, a decrease of 43,546 tons.

GEO. WESTINGHOUSE, JR., President. T. W. WELSH, Supt. JOHN CALDWELL, Treasurer. W. W. CARD, Secretary. H. H. WESTINGHOUSE General Manager.

THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 325,000 cars. This includes (with plain brakes) 232,000 freight cars, which is about 28 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording the opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 173,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.	Grand total.
1881	105	105
1882	1,085	1,190
1883	4,966	6,156
1884	15,051	21,207
1885	10,410	31,617
1886	8,946	40,563
1887	9,281	49,844
1888	27,696	77,540
1889	26,065	103,605
1890	50,502	154,107
1891	39,061	193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager. JOHN B. GRAY, Agent. C. C. HIGHAM, General Supt.

THE

AMERICAN BRAKE COMPANY.

NEW YORK OFFICE, 160 Broadway, JOHN B. GRAY, Agent.

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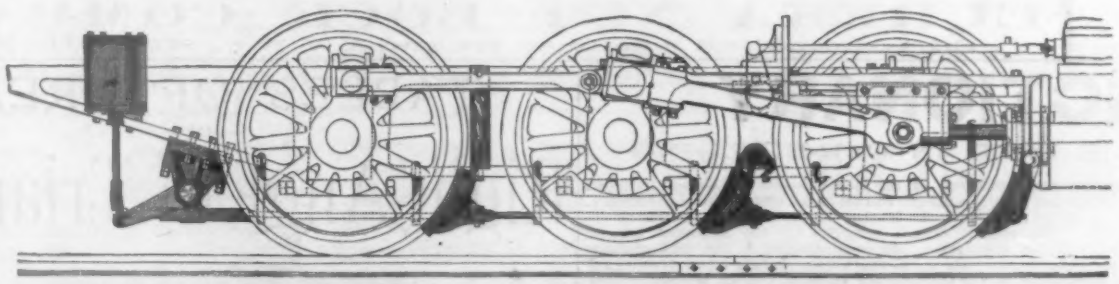
MANUFACTURERS OF

CHICAGO OFFICE, GRAND PACIFIC HOTEL.

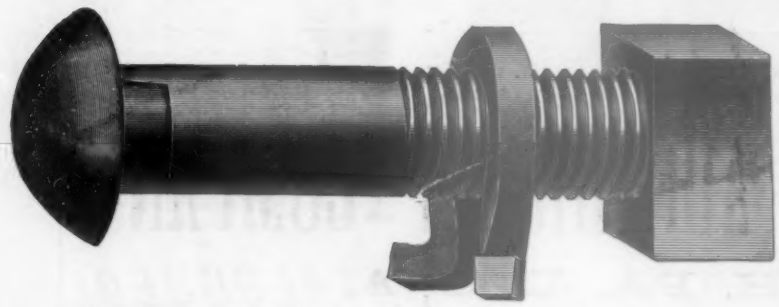
LOCOMOTIVE BRAKES.

General Offices and Shops, Second and Tyler Sts., ST. LOUIS, MO., U. S. A.



Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers furnished to operate with either STEAM AIR or VACUUM.

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the

STANDARD NUT LOCK CO.,

NOS. 236-248 BANK ST., NEWARK, N. J.

SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously: rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down *thread of bolt*.

The nut lock for ¾ bolt made of ¼ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, *i. e.*, the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in *inwardly curved* extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

Unlike any permanently placed, double washer, the Standard *is* interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position it offers double the locking friction of nut locks, which when in their *dead* "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.

THE STANDARD COMBINATION TIE PLATE AND BRACE

POSSESSES THE FOLLOWING MERITS:

1. It prevents absolutely the canting of the rail into the tie, thereby greatly increasing the life of the tie.
2. It prevents the rails from spreading or canting over and wearing one side only.
3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the *inside* spike for *holding* the rail; it also prevents the rail from working up and down, and laterally, thus making it impossible to wear the *neck of the spike*.
4. The plate and brace being made of malleable iron, is practically indestructible.

The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie.

P. O. Box 288, PHILADELPHIA, PA. **WILLIAM H. PHILLIPS.**

Simple. Easily Applied. Very Effective.

THE **NATIONAL LOCK WASHER**

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Sixty Millions in Use in Railroad Track

For Use on All Kinds and Classes of Work.

Made for all sizes of bolts.

A trial is requested.

Samples free of expense.

THE NATIONAL LOCK WASHER CO, Newark, N. J.

THE AMERICAN WASHER & MANUFACTURING CO.

EDWIN W. HINE, President. L. L. STURGES, Secretary and Treasurer. H. A. HARVEY, Vice-President.

THE AMERICAN "HARVEY RIBBED" NUT LOCK.

A Resilient Spiral Spring Washer with Ratchet-Shaped Teeth.

This is a positive lock, with spring temper, and will not cut thread of nut or bolt.

Patented.

13 & 15 RAILROAD PLACE, NEWARK, N. J.

CORRESPONDENCE AND ORDERS SOLICITED. SAMPLES FURNISHED FREE ON APPLICATION AND SENT TO ANY ADDRESS.

Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

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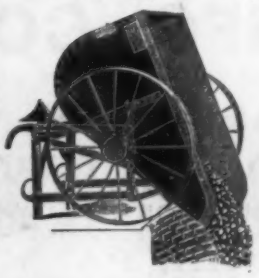

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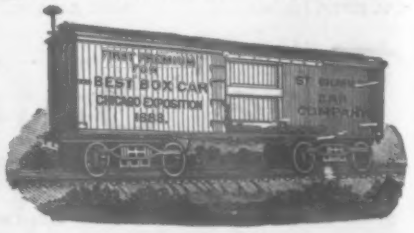

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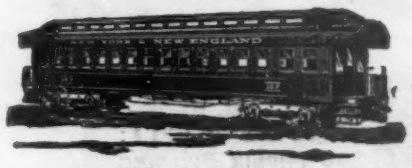

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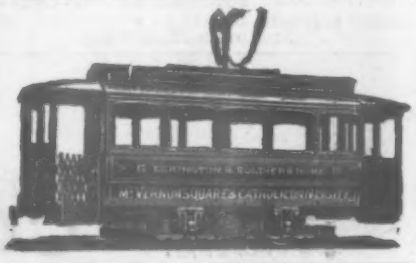

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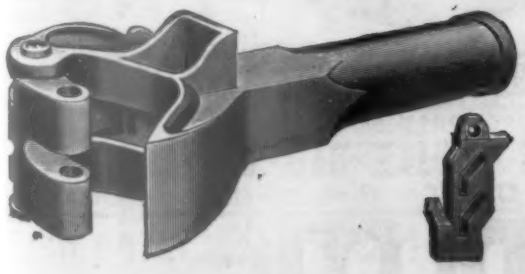

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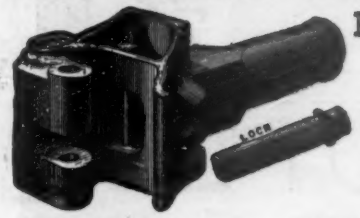

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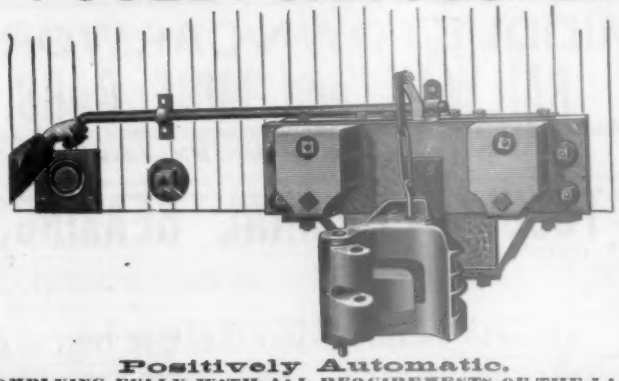

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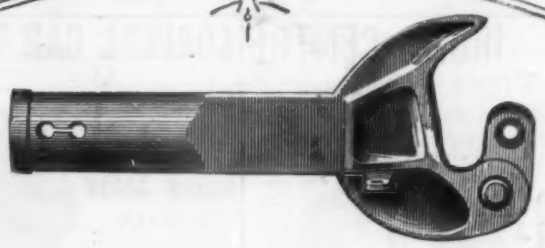

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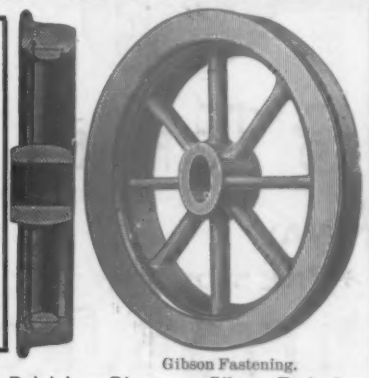

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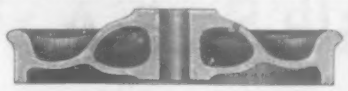

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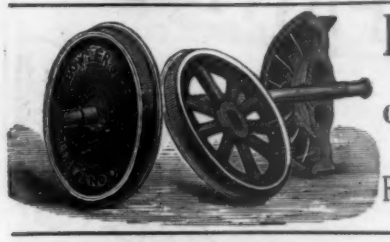

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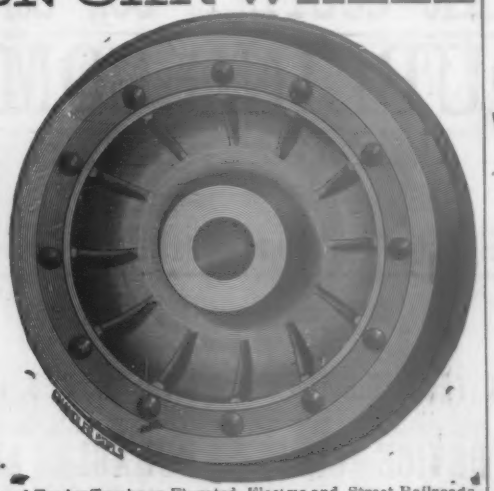

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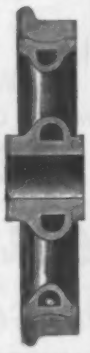

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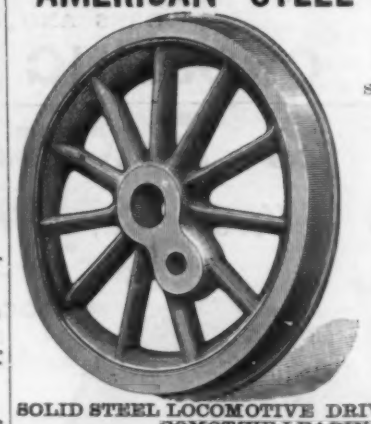

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These wheels can be used until tire is worn down, when flange may be turned off, and a new tire shrunk on. We can equip trains with Solid Steel Wheels, including Locomotive Drivers, from pony truck to last car. We also make M. C. B. Knuckles for repairs and a general line of R. R. Steel Castings. Correspondence Solicited.

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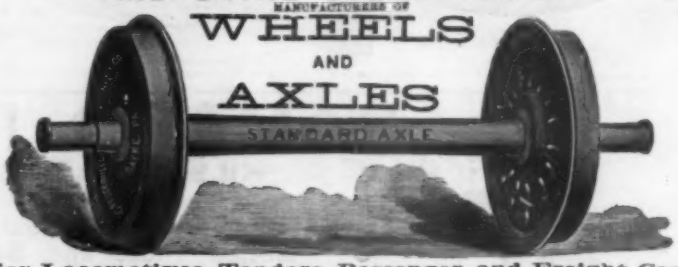

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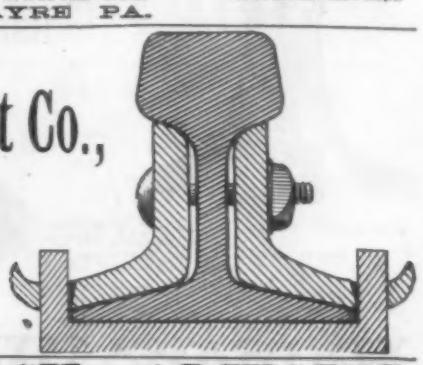

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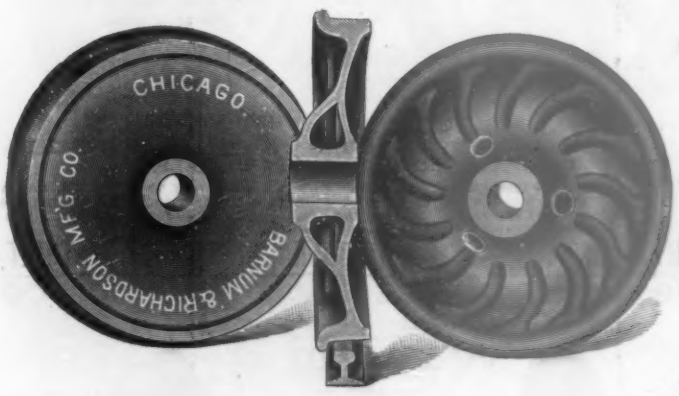

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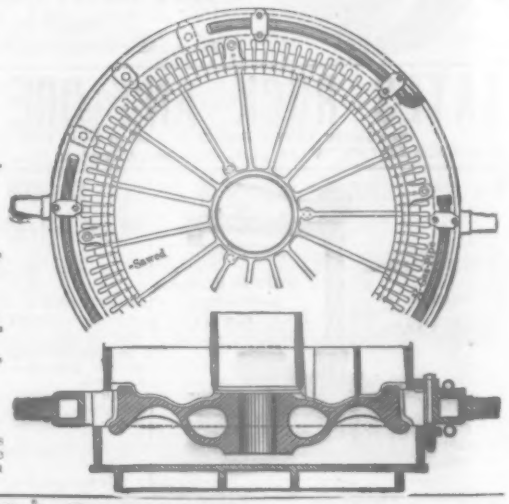

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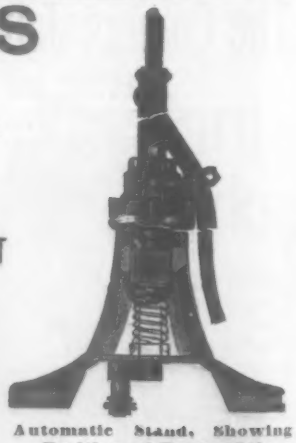

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FROM SPECIAL QUALITY CHARCOAL IRON

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WITH TIRES HAVING ANNULAR WEBS.

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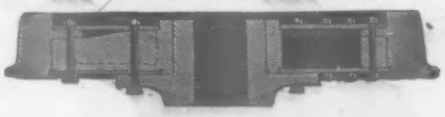

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Both of these Wheels can be Re-tired in any Ordinary Machine Shop

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NOTE.—On Sunday the White Train arrives Boston and New York at 9:00 p. m.

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—ONLY—

5 Hours and 40 Minutes.

The equipment of above trains will consist of baggage car, drawing room smoking car and two drawing room cars.

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Tickets will not be sold beyond the seating capacity of the train.

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On Sunday, May 22d, the Wisconsin Central Lines will resume its popular train service between Chicago, Waukesha and the Lake Region. Trains will leave the Grand Central Passenger Station, for Lake Villa (Fox Lake), Antioch, Mukwonago and Waukesha at 8:30 A. M., Sunday, arriving at Lake Villa 10:35 A. M., Antioch 10:40 A. M., Mukwonago 11:40 A. M., and Waukesha 11:49 A. M. Returning leave Waukesha 4:45 P. M., Mukwonago 5:05 P. M., Antioch 6:18 P. M., Lake Villa 6:30 P. M., arriving at Chicago 8:45 P. M. For the accommodation of excursionists desiring to remain in the country over Sunday "The Business Man's Special" will again be placed in service. This train will leave Waukesha at 5:30 A. M., arriving at Chicago at 8:50 A. M. For tickets, time tables and pamphlets apply to GEO. K. THOMPSON, City Passenger & Ticket Agent, Chicago, Ill. Or to JAS. C. POND, General Passenger & Ticket Agent, Chicago, Ill.

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Private Compartment Buffet Sleeping Cars, Standard Wagner Palace Sleeping Cars and Elegant Reclining Chair Cars on Night Trains; Luxurious Parlor and Cafe Dining Cars on Day Trains.

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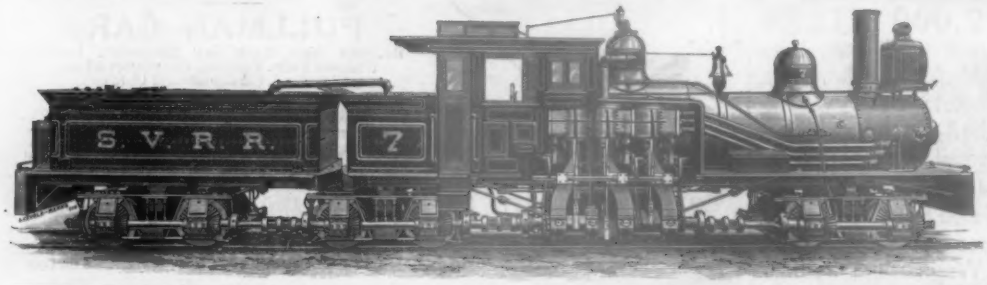

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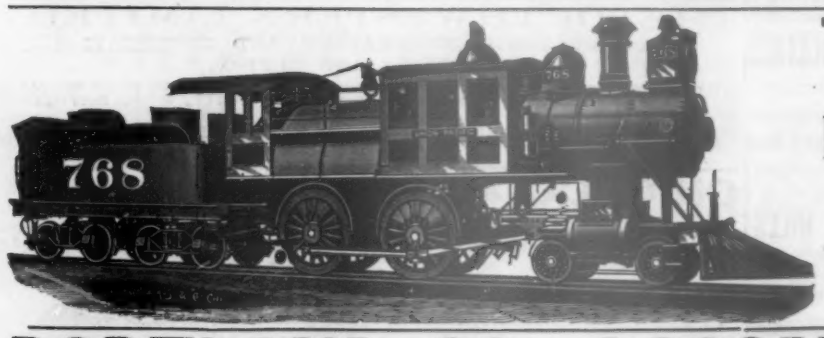

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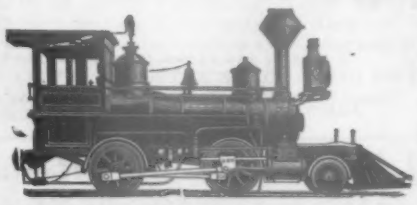

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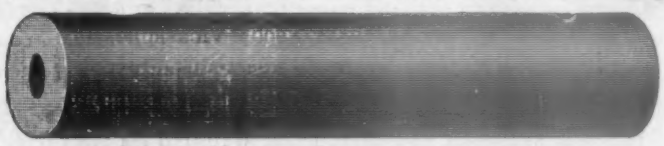

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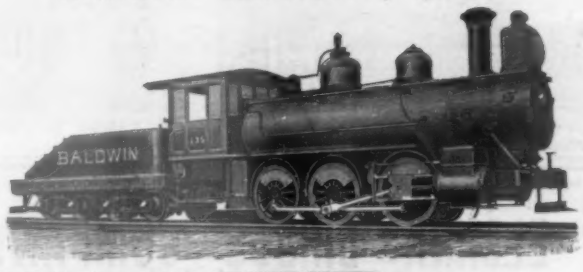

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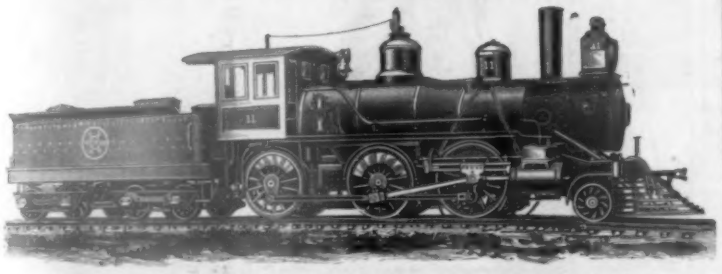

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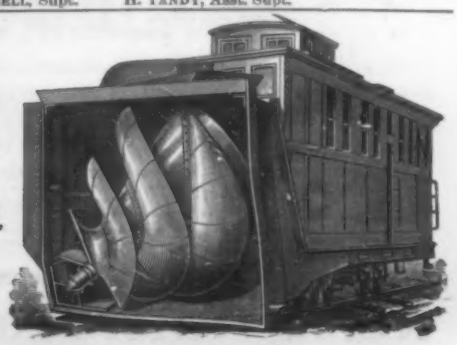

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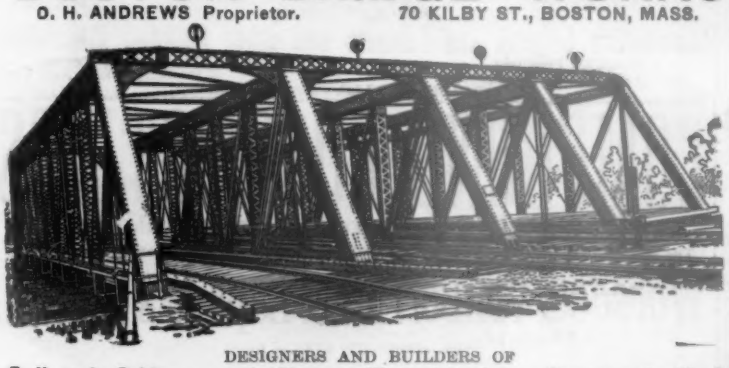

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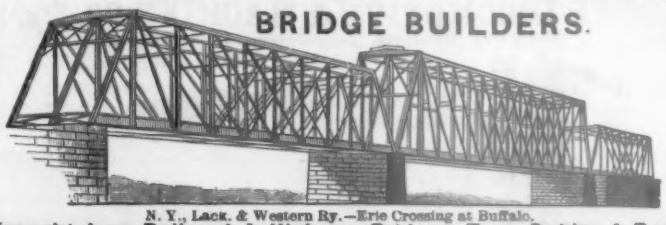

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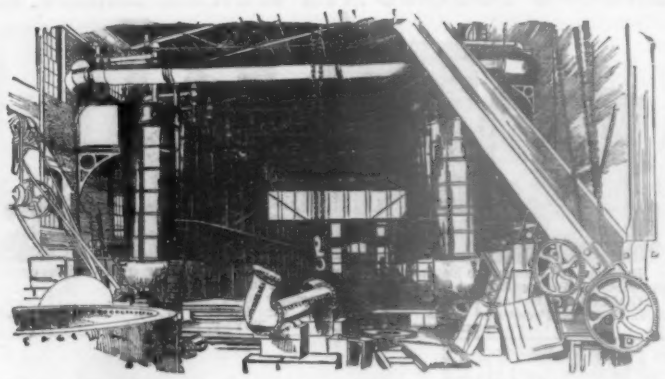

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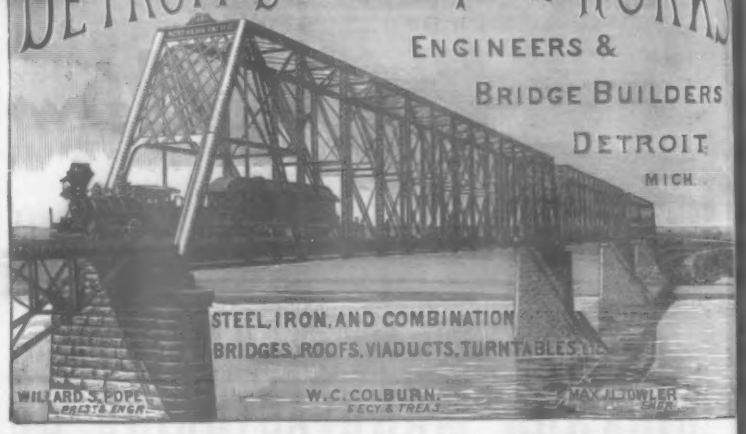
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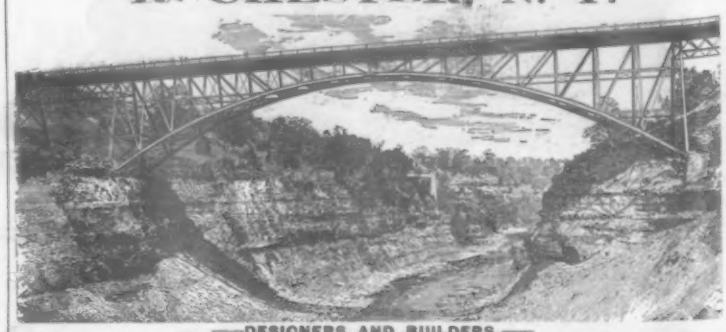

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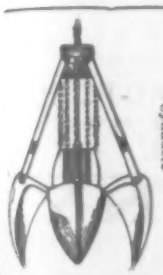

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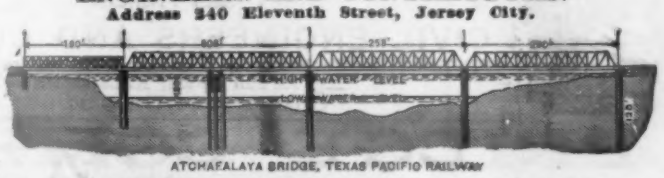

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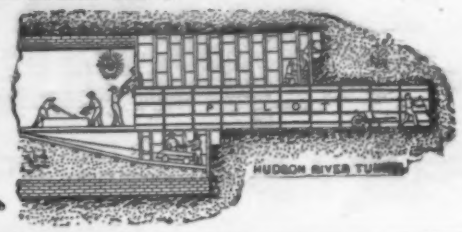

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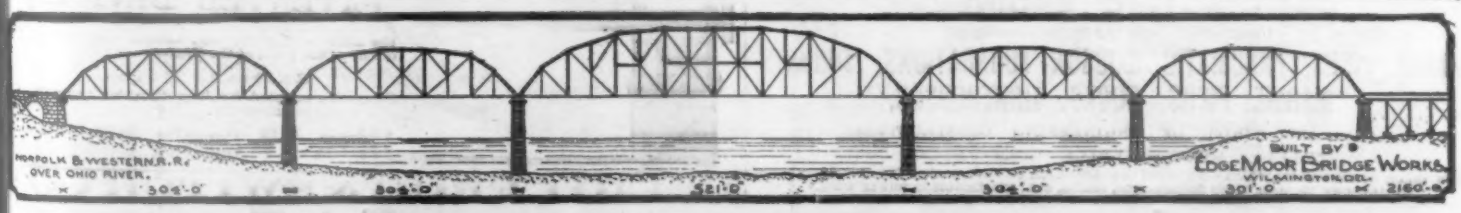

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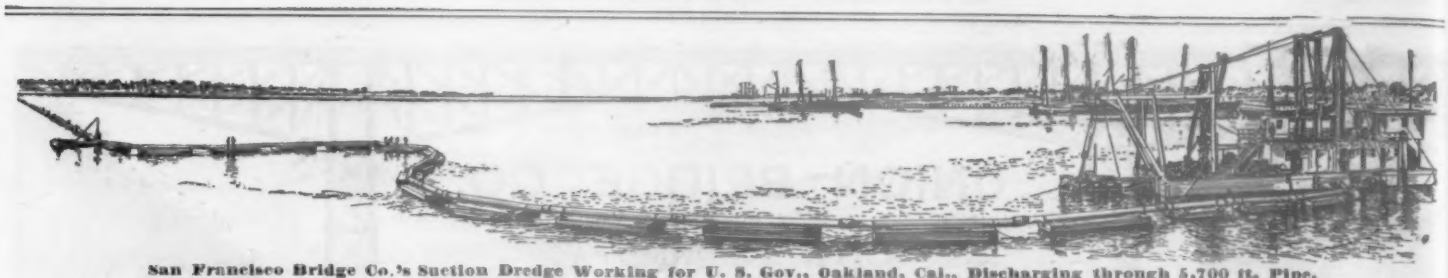

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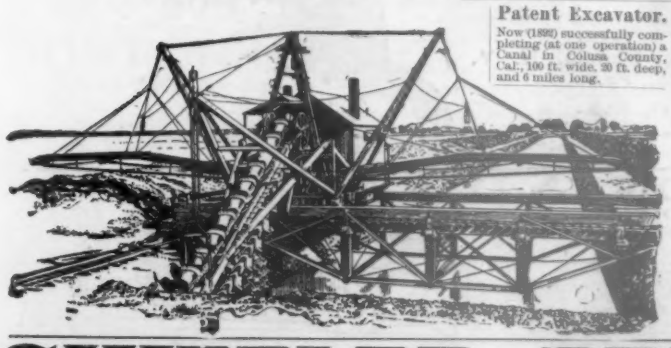

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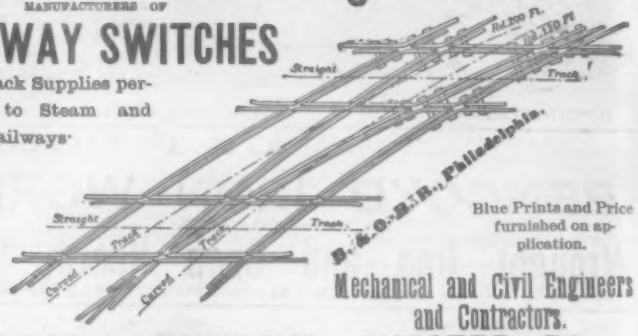

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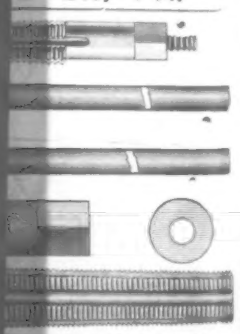

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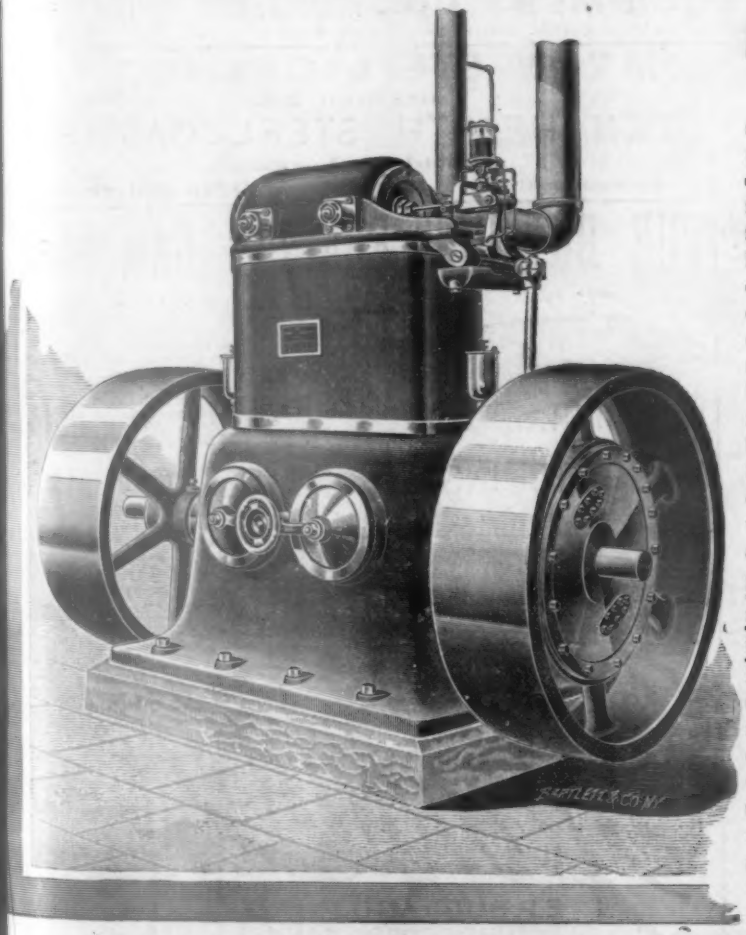

A PLAIN STATEMENT OF FACT.

The Compound Engine, when non-condensing, so far from possessing an economy superior to the Simple Engine, has been decisively proven, "much to the disgust of the stockholder," to show normal economy only at or about its rated power, and to fall off in economy faster than a Simple Engine as the load falls off; moreover, very much faster under the extreme light loads that are common at times in many industries. This point is at last reluctantly admitted by the more candid builders of such engines, most of whom now advise against compounding for variable loads. The reason is in their inability to divide the load and range of temperature proportionately and automatically between the cylinders at all points of cut-off. Hence the low-pressure cylinder expands its steam below atmosphere under a moderately early cut-off, thus converting itself into an Air Pump, and becoming a load upon the high-pressure cylinder instead of a co-laborer with it. This point was distinctly foreseen by the designers of the Westinghouse Compound Engine, and an entirely new principle was worked out, making expansion below atmosphere impossible under any load, however light. **For the first time in the history of Steam Engineering, either Simple or Compound, is built an engine which maintains essentially uniform economy, irrespective of load,** and hence for the first time the Compound Non-condensing Engine has been made practicable. The results, demonstrated by test, show that where an ordinary Compound will range from 25 lbs. to 70 lbs. water per H. P. per hour from full to quarter load, the Westinghouse Compound between the same limits, will range from 23 lbs. to 29 lbs. We have not deceived ourselves in this matter, and propose that the facts shall be understood. To those interested in the nicer points involved we will be pleased to send a reprint of the Paper read by Mr. F. M. Rites on this subject at the late meeting of the American Society of Mechanical Engineers at San Francisco.

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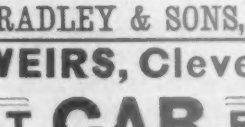
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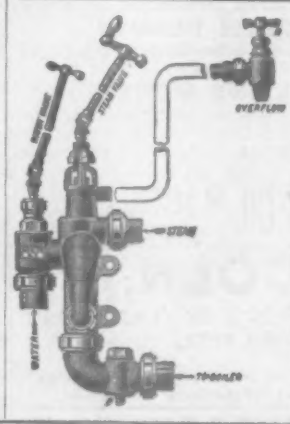

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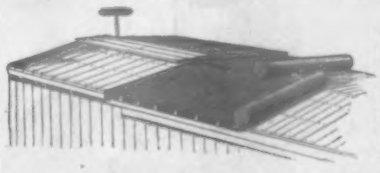
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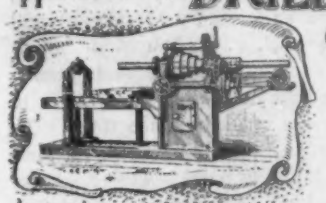
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